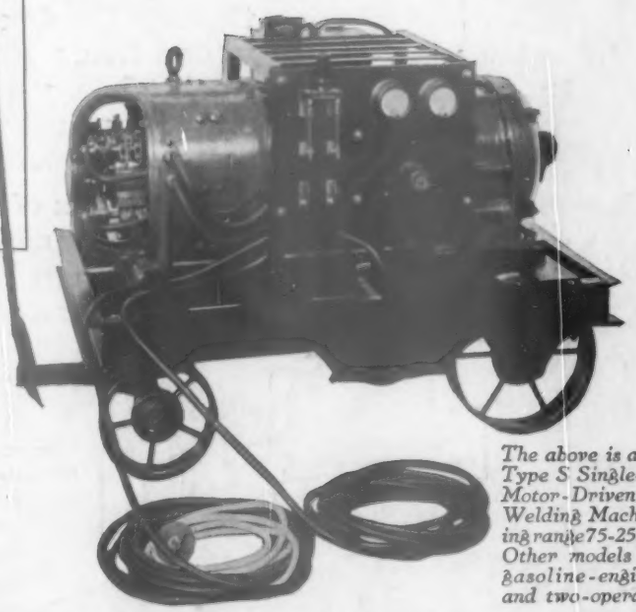
The Welding Engineer

Founded by L. B. Mackenzie, 1916

MARCH, 1926 VOL. 11, No. 3

$3.00 per year in U. S. 608 S. Dearborn St., Chicago, Ill. Reg. U. S. Pat. Office $4.00 per year abroad

"I'll Tell You Why I Like Wilson Wire— It's Always Uniform"



The above is a Wilson Type S Single-Operator Motor-Driven Electric Welding Machine, welding range 75-250 amperes. Other models include gasoline-engine-driven and two-operator units.

Simplicity—Close Control—Ruggedness

Unexcelled simplicity, close regulation, strength and ruggedness of every part **—better engineering throughout**—these are what make the Wilson Type S a **better welding machine.**

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WILSON

WELDING MACHINES AND WELDING WIRE

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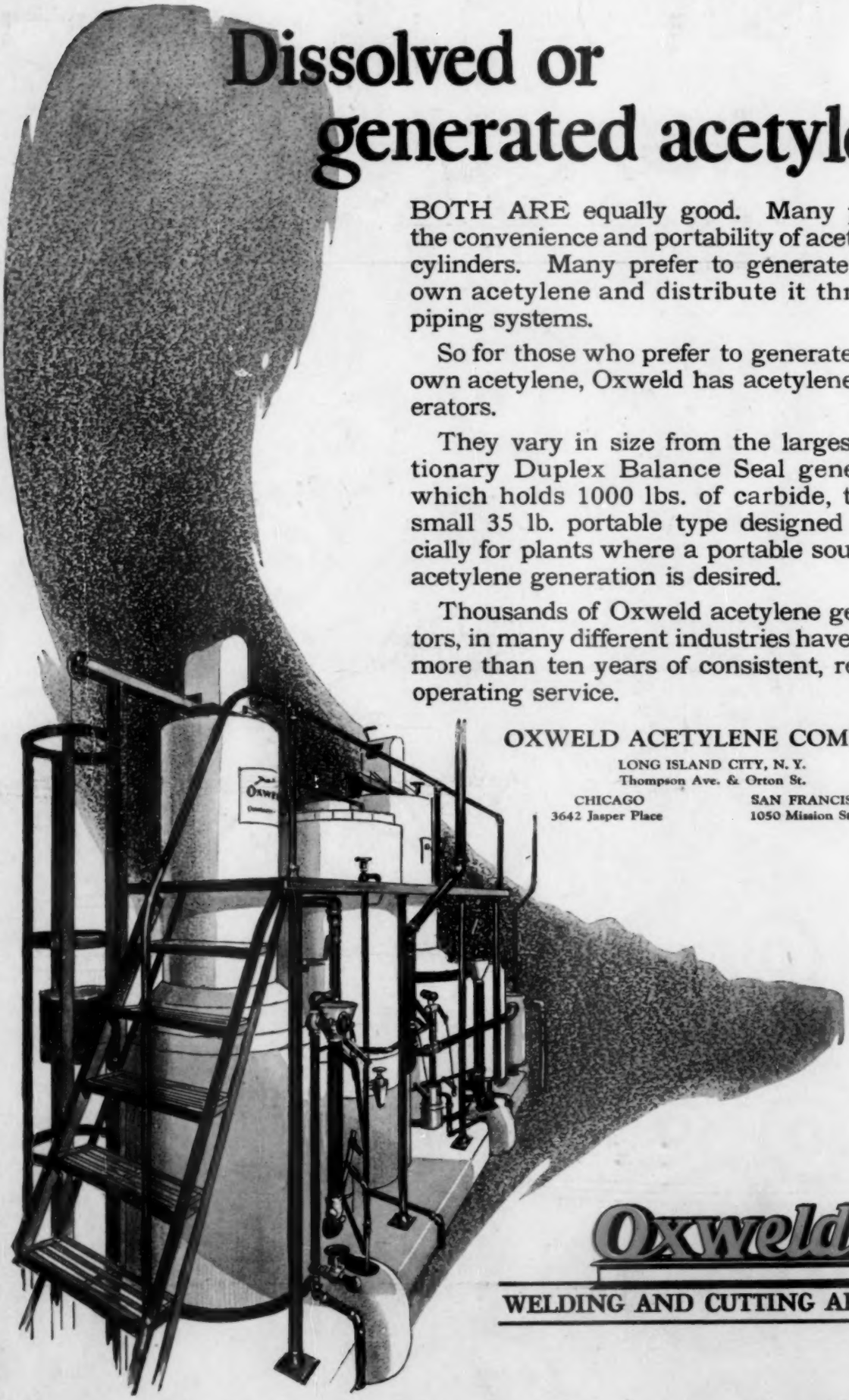
Dissolved or generated acetylene?



BOTH ARE equally good. Many prefer the convenience and portability of acetylene cylinders. Many prefer to generate their own acetylene and distribute it through piping systems.

So for those who prefer to generate their own acetylene, Oxweld has acetylene generators.

They vary in size from the largest stationary Duplex Balance Seal generator which holds 1000 lbs. of carbide, to the small 35 lb. portable type designed especially for plants where a portable source of acetylene generation is desired.

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The Welding Engineer

Founded by L. B. Mackenzie, 1916 — Reg. U. S. Pat. Office

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Concerning a Business Chestnut

AMONG the chestnuts which are due for a proper roasting once in a while is the old business chestnut that the manufacturer who does not advertise gives his customer the benefit of the saving in the shape of a lower price. When costs are figured properly the selling cost is included, and when advertising is done judiciously the selling cost, including the cost of advertising can be appreciably lowered. Figure it yourself. One fifth of one salesman's cost will cause a page advertisement in a business paper reaching four thousand readers to make forty-eight thousand calls per year each, one of these calls contributing to make his visits shorter and more productive. The salesman goes away if you are absent or busy, with his story untold. The advertisement sticks around for your hour of leisure to read it, five minutes or five days at no extra cost. The manufacturers who advertise to you in your business paper are entitled to your respect and confidence. They are using space to reduce the cost of getting your order for their products. If you think this part of the cost does not affect the price you pay, ask any good experienced accountant.

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Last Advertising forms close at 8:00 a. m. on the 13th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

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Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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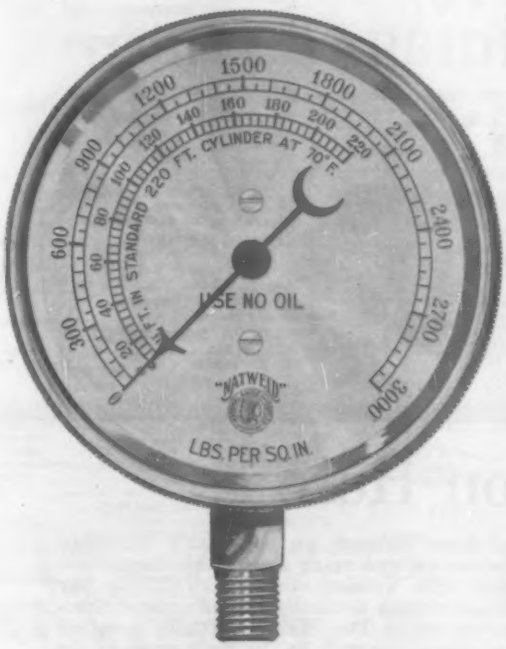

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Welding Service Co.
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The Welding Engineer 608 S. Dearborn St., Chicago

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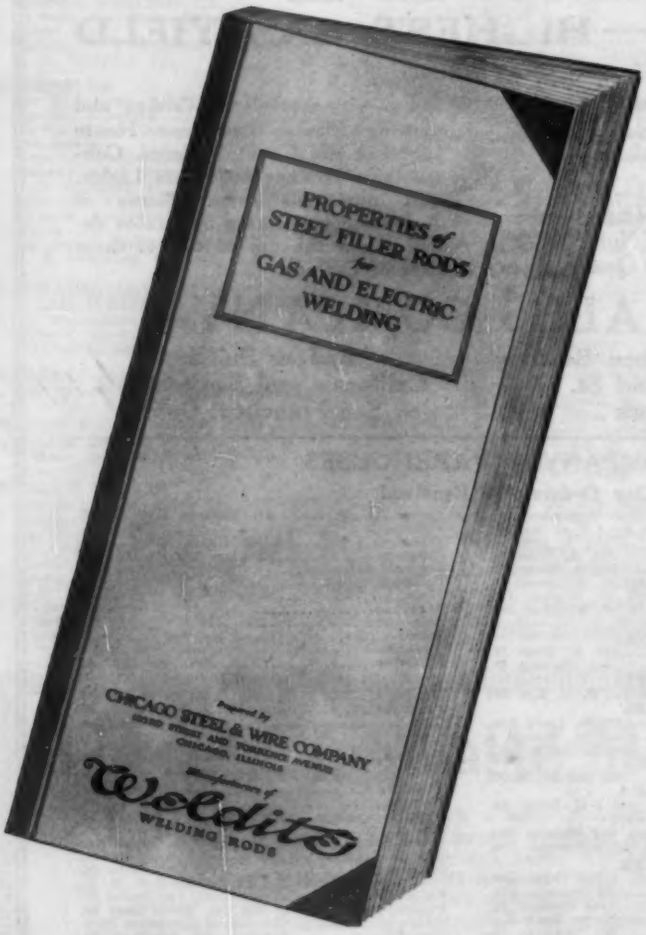

This Booklet

Tells for the first time the scientific facts concerning Welding Rod. It answers in plain language literally hundreds of questions for the welder.

Do you know---

Why sulphur segregated to the center of a rod does no harm but if distributed throughout the rod causes poor welds?

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What the real difference is between gas and electric rod?

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Every manufacturer of automobiles should be aware of the tremendous savings that are being effected by the automatic arc welding of axle housings.

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23-15

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See Letter Below

Bradford Pa.
Nov. 30 – 1925

The Lincoln Elect. Co.
Cleveland, Ohio

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I will ans. your welcome letter which I rec. some time ago but too busy to ans. right away.

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Very Sincerily Yours
J. H. Shumaker

The Lincoln Electric Co., Cleveland, Ohio

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In Acetylene and Electric Welding

You will find a welding rod for every use, in acetylene and electric welding, carried in our Chicago stocks for immediate shipment. A few important kinds are mentioned below. Testing samples sent free.

Norweld Special—*Acetylene*
Copper coated, exceptionally low in carbon, phosphorus and sulphur. Conforms to A. W. S. Spec. G. No. 1-A. Should be used when welding galvanized and high pressure tanks, sheets or wherever maximum ductility and non-porous welds are required.

Norweld—*Acetylene*
Slightly higher in carbon than Norweld Special, Copper coated, soft, uniform in quality. Recommended for welding of wrought iron, steel, tanks, boiler plate, sheets, angles, flues, etc. where higher tensile strength is required.

Castweld—*Acetylene*
Made of the highest grade Virgin Pig Iron. Contains over 3% silicon, extremely low in manganese, phosphorus and sulphur. Of correct analysis to produce soft machineable welds.

A Practical Book on Welding

Describing Our Complete Line of Rods

Bronzeweld—*Acetylene*
A drawn Tobin Bronze rod for welding bronze or brass and brazing malleable iron or steel parts.

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A special nickel steel; composition so balanced as to produce maximum strength and high ductility. Recommended for welding cold rolled shafting, nickel and chrome steels, crank shafts, axles, frames and all parts subjected to excessive strains. **Flux Coated if desired.**

Elecweld Special—*Electric*
A very low carbon bare wire, medium hard and soft, very low in phosphorus and sulphur. Especially treated in our plant to improve its welding properties. Conforms to A. W. S. Spec. E. No. 1-A. **Furnished flux coated when desired.** Recommended to produce maximum ductility and non-porosity.

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Slightly higher in carbon than Elecweld Special. Conforming to A. W. S. Spec. E. No. 1-B. Recommended where high tensile strength is required. **Flux coated when desired.**

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A mild steel, plain finished rod, usually furnished in larger sizes in 36 inch lengths. Particularly suited for welding steel castings with the carbon arc.

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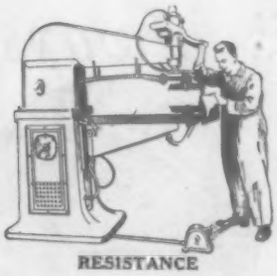

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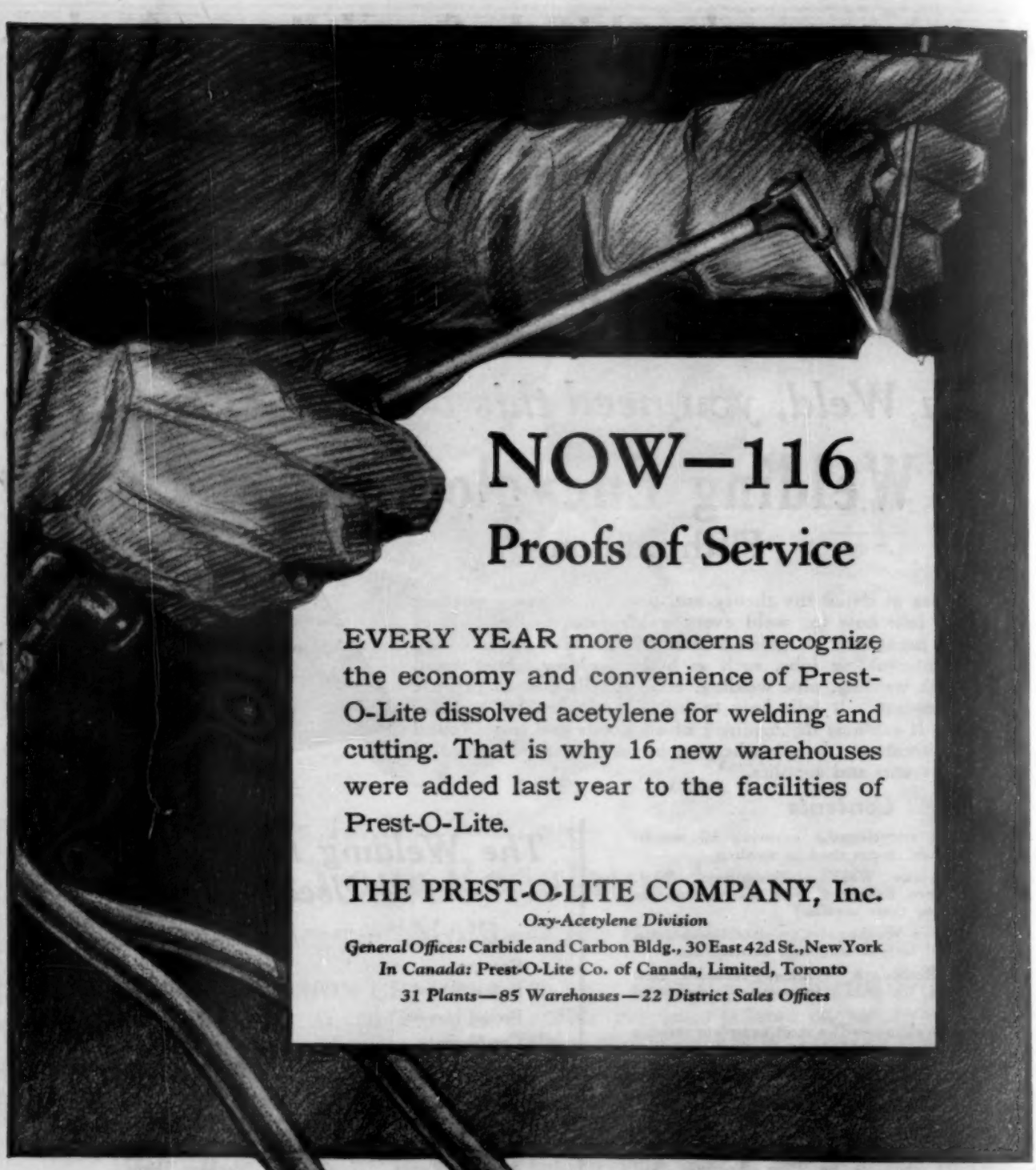
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EDITORIAL

An Experiment in Licensing

PUTTING the operator's ability on record is not for the purpose of making his work harder, but rather to make it better and to make the trade as a whole more attractive to the conscientious and efficient workman. In some localities it has for several years been the rule to issue permits to welders who qualified by tests to work on jobs subject to insurance and government inspection. If this were made a general rule, and applied to a wider range of welding operations, employers in plants where any welding was done could profit in two ways. They could either require their welders to obtain permits or subject them to the same examination and issue a shop permit before giving them full welder's pay. There is no doubt that a welder may be able to do a standardized weld in a satisfactory manner and either know or not know enough about the principles of good welding to qualify as a real welder. In one city a plan is in operation whereby a city official examines welders and issues permits. Applicants are questioned to ascertain how much they know about welding, and if they make a poor showing are required to try again. It is said that the permit already has gained enough respect to be in considerable demand. Suppose this had been common practice for the past ten years. The incentive to study and develop greater skill could not fail to have had a beneficial effect. There are complications involved, however, in the thought of making and carrying out a plan for universal licensing. Not the least of these is the vast amount of political work necessary. A more practical and feasible way to accomplish the object, that of making welding operations operate at their maximum efficiency, would seem to lie in the general plan which is being followed by the leading firms of the industry; namely, developing a greater interest in welding principles on the part of plant executives and managers, and obtaining intelligent supervision of all welding operations. Meanwhile, wherever local conditions make it possible, the plan of licensing welders is an excellent one. It promises to eliminate many costly failures and give the good operator a definite classification.

Co-operation in Industry

IT AMOUNTS to more than singing "Hail! Hail! the Gang's All Here!" at an annual banquet. Sometimes it is best displayed by voluntary actions which may mean either real material assistance or just keeping up the "morale of the troops." Helping the other fellow fill orders when his plant is broken down is not unheard of in this industry. It has been done and it helps everybody. There are occasions, too, when you can work with your competitor for common glory, and do a better bit yourself by not seeking favor. That's done, too. Another condition arises when it is possible to help a competitor make good on an important contract. It's better for the industry to help prove that it can be done than to watch him fail and declare you could have done it. Co-operation starts where conversation leaves off. There's a lot of sportsmanship in it. Happily, co-operation is responsible for a great measure of the progress which has brought the welding industry so rapidly to the fore.

As Others See Them

A STORY recently told about the welding conditions in one plant includes a suggestion for maintaining welding on the highest possible plane. A bulletin board is used to record the quality of the work of each operator. It tells every man just how his work compares with that of the others. Such a plan must be worked intelligently to get a result, and fairly to avoid dissatisfaction. It requires, for completeness, some provision for instruction, for helping the inefficient to develop more skill.

Cast Iron Brazing

CAST iron brazing has received so much attention during the past few years that some welders seem to think it is being generally recommended as a substitute for cast iron welding. While it is true that a great many cases have been found where it is more advantageous to use the bronze rod than to make a real cast iron weld, there is one other important application of the bronze rod which may be overlooked in the argument as to comparative merits of welding and brazing. That is, the fact that a great many jobs are being handled today by the use of bronze, which would not be considered an economical or desirable job to undertake by the straight cast iron welding process. In other words, the development and perfection of the process of applying bronze to cast iron has really opened up a new field of usefulness for the oxy-accetylene torch.

The Future of Welding

WELDING has long since passed the stage in its development when it could be considered as principally a repair or emergency process. For a long time it has been considered in this light by engineers and factory executives. But the production idea has been growing all the time and there is scarcely any kind of metal fabrication which has not been attempted successfully, using the torch, or arc or the resistance welder for one or more operations. All signs point to production work as being an important field for welding in the future. This development will undoubtedly result in improvements making the way a little easier for additional products. Welding salesmen in the future will be looking for manufacturing possibilities rather than waiting for hammer columns to crack or tanks to spring leaks.

The Business Outlook

THE Wall Street bear had a fit and fell into it. Or was it the Bull? At any rate there was enough excitement for a few days to get Wall Street news into the spaces usually reserved by some of our best murders. But the country was too busy to go to the bow-wows; it just stayed right on the job, and at last reports was still making money. 1926 will be a prosperous year if the country stays on the job.

Your Friend, the Skeptic

AMONG those who are assisting materially to the progress of the welding industry is your friend who does not believe in welding. You believe in it, alright, and if you have not convinced him, don't blame him. You need him to put you on your mettle, to make you produce more and better evidence, to make welding so good that he can't turn it down. He's responsible for getting a lot of research and development work done. And the harder he is to convince, the better his recommendation will be when he becomes a booster.

Quality as a Plant Standard

NOBODY who habitually uses the telephone can fail to admire the high production standard which must be maintained in the plant of the Western Electric Company, where the instruments are made. This quality of workmanship, says Mr. Swangren in paper printed this month, is demanded of every department including the welding department. His paper is a splendid presentation of welding possibilities when welding is properly organized. We have seen welds made as good as Western Electric Co. telephones. The process of making such welds is termed "welding."

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LINDE OXYGEN

Gold in the Welding Processes*

Those Who Make Welding Pay Dividends Are Simply Applying Everyday Knowledge Where It Does the Most Good

By R. E. Kinkead†

THERE is a rich old fellow up in Southern Michigan I have known for a good many years, who has a hide as thick as human hides ever get, but he also has a heart as big as a watermelon. Now the old man loves to murder the young salesman. And at the time of which I speak we had one who held all records in that direction. I got the story in a round about way of what happened when our young spell binder went up against the old man, but I think I can tell it substantially straight altho of course, it will not be literally accurate.

R. E. Kinkead

The lad went at him something like this:

"Sir, I represent the most famous aggregation of welding experts in the United States and that means the world. We as engineers have spent more thought and study on the subject of welding than all of the other people in the industry. And I come to you, Sir with all this knowledge to put it at your service to increase your profit, to expand your business, to make you the most successful manufacturer in your line of business in the country.

The old man looked out of the window awhile and dug around through the papers on his desk awhile until he found a half of a cigar which he had started to smoke right after lunch and relighted it.

"Yes, I have heard of your firm," the old man said. "Are you a technical man yourself?"

"Mechanical Engineer from M. I. T. and two years practical experience in welding application work. I think I know something about mechanical problems."

But if he had been older, he would have seen the wicked gleam in the old man's eye and got his hat and gone away from there. But he didn't,—so the old man let him have it with his time honored gag.

"Well son" he said, "with all your training and experience you certainly ought to show an old duffer like me something. Now, I just want to ask you some questions."

A Question of Velocity

"I have a paper weight here and I am going to roll it along this table which is seven feet long. It will take the paper weight one second to go the length of the table. What is the true velocity of the paper weight?"

Right off the bat came the answer—"Seven feet per second."

"Now son, I am disappointed in that answer," said the old man "because I asked you for the true velocity and you gave the apparent velocity. You know the paper weight was doing about a thousand miles per hour due to the earth's rotation before I started to throw it across the table. Besides that the paper weight has velocity due to the earth's travel in its orbit and due to the drift of the solar system. I am afraid you never will know what the true velocity of the paper weight was, my boy."

"I want to ask you, young man, can you weld aluminum? We use a lot of it around here."

"Well, we do fairly well with the electric arc process on sheet aluminum," answered the lad, who by this time was getting a bit conservative." Then the old man sprung another old standby.

"Did you ever really see any aluminum?"

The lad fell hard. "Certainly Sir, the paper weight you have in your hand is aluminum and I can certainly see it."

What is Aluminum?

"Son, you are getting more disappointing to me every minute," said the old man. "If you ever welded any aluminum you ought to know that oxide forms rapidly on aluminum. In fact the only way you can weld it is to make your fusion under the surface of the molten metal where there is no oxygen present. Now you never saw any aluminum in your life outside of a laboratory. All you ever saw was aluminum oxide on the surface of aluminum because aluminum as such cannot exist in the atmosphere."

The boy had enough by this time and he went away from there. The old man was happy the rest of the day.

There is a real lesson for all of us in the old man's joke on the fresh young salesman. The old man did not know anything more than the average high school boy knows about velocity or the average high school boy knows about aluminum, but get this point, he did know the relation between simple facts and could see them in their true perspective. Difference in mental ability is not so much a difference of actual knowledge as it is a difference in connection of almost universally known facts. After all that is about all there is to welding.

Ordinary Men With Unusual Common Sense

Almost all of the important things in connection with the great field of usefulness of welding are universally known. The marvels which have come about in the industrial world by the application of welding have been accomplished by quite ordinary men by the application of quite ordinary mental processes.

Within a hundred miles of Buffalo, there is a plant which has been running night and day for the last three years trying to keep up with orders. This plant used to make large cast iron fittings used for oil, water and gas pipe lines. A workman in the plant got to thinking about the matter and decided that the fittings were too heavy and cost too much. The result was that they brought out a line of welded steel fittings which weighed half as much as the cast iron fittings and cost less than half as much to make. The users in the field saved a lot of money because less labor was required to move the lighter fittings around. While the cast iron fittings frequently leaked due to sand spots in the castings, the welded steel fittings never leaked in service.

Now isn't that simple? That workman did not know anything about integral calculus or a lot of other popular intellectual sports but he did know the relation between some very simple well known facts.

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A Better Way of Doing a Job

Over in Eastern Ohio, several years ago, a draughtsman and a couple of salesmen were talking one day and the subject was brought up relative to the difficulty of putting pipes, wires and ducts in a modern building due to the fact that the joists were solid. The result of that line of thought was, a new joist woven from round bar stock and welded together. Every structural engineer in that little locality thought those fellows were crazy to make a joist in that way. Today those fellows are running one of the most rapidly expanding business institutions in the State of Ohio. Now, those fellows did not know anything about permutations and combinations in mathematics, and there was a lot they had to learn about structural steel. They just looked into a situation and found out a better way of doing a job. They did not know a volt from an ampere or a welding torch from a cutting torch, but they did know how to do a job better than it had ever been done before.

After all about all there is to getting along in any business is to find out what people want to accomplish and then help them to do it better than it has ever been done before.

Putting Logic to Work

In 1914, I got acquainted with a boilermaker in a well known shop. He was interested in welding too. He made some kind of a deal with his boss so that he could stay in the shop after working hours and weld samples of different kinds of jobs. Shortly after that, he got another job as Superintendent of a shop that did more welding. After a year and a half of that he went into business for himself making welding repairs to machinery and boilers. Today that man operates the largest commercial welding shop to my knowledge in this country and is worth at least $250,000. This man knew two important facts and he made a fortune because he really knew the relation of those facts to other facts. This is the basis of his success:

1. Any factory manager would rather repair a broken piece of machinery than buy a new one, if he could be certain that the repair job would be satisfactory.
2. A considerable number of factory managers will sell good machinery which is slightly worn or broken for scrap value, because they cannot be convinced that satisfactory repairs can be made.

Every Plant a Customer

Now, my friend got them going and coming. Every plant in his district was a prospective customer. As soon as he found out that a plant had a broken or badly worn piece of machinery, he would go out and submit a bid to repair the machine. If the factory manager could not be convinced that the job could be done, my friend would try to buy the machine. If he bought the machine because the factory manager thought it could not be repaired, he of course bought it at scrap value. He would then repair the machine and sell it to some other fellow and guarantee that the machine would not fail again where it had been welded or repaired.

I have told several stories here this evening and if I have succeeded at all in what I am trying to do, I have made the point that opportunities for making money out of welding are pretty common. There are bigger opportunities right here in Buffalo than any I have mentioned.

Opportunities Are Increasing

The door of opportunity is open as never before to any man who knows what the torch, the electric arc or the resistance welder will do and knows the simplest things that are going on in Buffalo today. The machinery building and metal working industries of this industrial district will be revolutionized within the next ten years. The welding industry will be called upon to furnish more experienced individuals than it can possibly furnish. There are many operators of the welding processes today who ten years from today will be factory managers. There are plenty of men in Buffalo in the welding industry today who are making two thousand dollars a year who will be making ten thousand dollars a year in ten years. You say, how do I know all of these things? That is reasonable. I have seen these things happen all of them in the last ten years and they are happening with increasing frequency—tremendously increasing frequency. Now, that reminds me of a little incident which happened last week right here in Buffalo.

I was in one of the largest shops in the city and was casually talking to one of the welding operators who was lamenting the bye-gone happy days when a good welder could get a dollar and a quarter an hour, and have the Boss call him "Mister" every time he passed through the shop. The welding operator turned back to his work and I stood in the same spot and made a survey of the welding opportunities I could see without stepping out of a one foot circle.

Where Welding Makes Money

The first thing I saw was a charging machine for handling material to and from a couple of large annealing furnaces. The machine was evidently built specially for the purpose of that particular plant. A rough calculation of the cost would indicate that not less than $5,000.00 in capital was tied up in that charging machine. Then I looked for welding applications on the machine. Here is what I saw. That charging machine could have been built complete for $1,500.00 by the very man who thought the happy days of welding are over. The fellow who designed that charging machine spent more for patterns alone than the whole machine should have cost.

The next thing I saw was a battery of large presses, worth not less than $150,000.00. Now presses are designed and sold a good deal like gas engines, air compressors and similar machinery. They sell by the pound. The heavier you can make them, the more money you can get for them. Of course that being the case, the best material to use is cast iron because this material gives less strength per pound for the purpose than any other material of contruction used of the purpose. Now these presses were supplied with cast iron frames that were heavy enough to sink a battle ship. Our discontented welder friend could have welded together some structural steel and made those press frames and saved his firm $50,000.00 on these presses.

Men Who Know, Often Cannot See

Over in the corner were two storage battery trucks made right here in Buffalo. They had steel frames riveted together and were loaded down with castings which could have been made of welded steel at a saving. The sorry welder could do a lot of things for the fellow who makes that shop truck.

Now the interesting thing about this situation is, that the fellow who could not see the opportunity for welding actually knew as much about the fundamental facts as anyone and probably a lot more than most people who know nothing of welding.

We are very apt to think that while welding will not do anything for us, if we could only get over into the other fellow's plant, we could show him a thing or two that would open his eyes. But the big opportunity is right at home with the things we know most about. You have of course, heard about the people who couldn't make any money out of their big cast iron lawn rollers, because they cost more than any householder was willing to pay to have a nice lawn. They had to be heavy which meant high cost and large freight charges. One day a welder asked them why they did not weld up a steel can and leave a bung in it so that the purchaser could fill the can with water when he got it to make it heavy. Well, they could sell lawn rollers after that and they are selling them today.

The Story of Duco

I do not want to convey to you the idea that the possession of knowledge, training and experience, is a handicap to your success in the welding industry. I do want to convey the idea however, that the biggest successes have been made by the intelligent application of almost universally known facts. It has been my privilege to do some work with one of the most distinguished automotive engineers in this country. The great achievements of this man have been due largely to his ability to see well known facts in their true relation to each other. The gentleman I refer to is Mr. Chas. F. Kettering, President of the General Motors Research Corporation. Perhaps you have heard of the job which he did in connection with the painting of auto-

mobile bodies. It was a marvelous achievement. It has effected savings which already have run into millions of dollars. Let me illustrate by this job, the simplicity and directness with which this great man's mind works.

The automotive industry had reached the point in the number of cars produced at which the capital tied up in buildings to house the automobiles in process of manufacture had become a serious burden. He undertook the job of improving the situation. He found out that it took eight to ten days to paint the body. Now it was evident that a company making a thousand cars a day would have to have building space to cover eight thousand cars if it took eight days to paint one car. If the time could be shortened to four days, it would only take building capacity for four thousand cars. The difference in capital outlay for buildings in the automotive industry runs into millions of dollars not three or four million dollars but in terms of fifty million dollars. This distinguished engineer went to the foreman of a paint shop and started to ask questions and I will try to give you the substance of the conversation. Please keep in mind that this engineer is distinguished in the field of chemistry, electrical engineering and a lot of other technical subjects. He said to the foreman.

"Why does it take you eight to ten days to paint a car?"

The Foreman said, "Because it takes a long time for each coat to dry."

The Engineer asked, "Why"?

After some shifting around the foreman answered—that they used a linseed oil base for the paint, and that they didn't know how to dry the linseed oil paint any faster.

The next question the engineer asked was, "Why do you use linseed oil"?

To which the foreman replied—That he didn't know. That linseed oil had been used for paint ever since he had been a painter and that he did not believe that you could use anything else.

Well, Mr. Kettering and his engineers simply went out and found a paint that didn't take so long to dry. The first paint they tried using a spray gun, dried so fast that between the time it left the gun and the time it hit the body, it had dried so much that it wouldn't stick to the body. From then on the problem was merely one of slowing down the speed with which that paint dried, so that they could keep it wet long enough to get it on the body.

Duco paint for automobiles is the result of this research, for that is what it was and it has saved the automotive industry millions of dollars and it is a better paint than was ever used for the purpose before. Now isn't that simple? Here is one of the biggest engineering jobs that has been done in the automotive industry in the last ten years. It was done by a man of distinguished technical achievement, yet it was so simple that anyone of us might have done the same thing without the technical equipment available to Mr. Kettering.

Great progress is open to you and me if we can only see the relationship between the simple facts with which we are already familiar and with which we come in contact every day.

I have talked to a good many fellows in the welding industry who have told me that if they had a lot of money, that they could do some wonderful things in the welding industry. But the strange part about it is that most of the big things that are done in this world are done by some fellow who hasn't got much money. That is the reason he does them.

Made Success Without Capital

Let me cite a case with which I am familiar. A number of years ago, I was down in New England and I heard of a little welding shop that wanted an arc welder. I called on the man and had a talk with him. His little hole in the wall shop was filled up with fifty cent welding jobs, such as broken furnace shakers, stove lids and other jobs which every welding shop would rather do without. After talking with the proprietor for awhile, he told me that he would like to have one of our welders but that he did not have any money to buy it with. We were not at that time running a philanthropic institution so that my conversation from that point on had mainly to do with the weather and with other subjects entirely foreign to the welding business. I was going to Boston and asked the fellow, what time I could get a train. He said that there was one in fifteen minutes and that since he had to go to Boston to, we might ride together. On the way into Boston, he got to telling me how he happened to be in the welding business. He had been a college professor. As his family grew in size it became evident to him that his college professor's salary was not going to provide for that family. He became interested in welding and thought that he could make a success of it. He talked the matter over with his wife and told her that so long as they were going to starve anyhow, he would like to take a chance at the welding business and see if he could not do a little better. His wife said—to go ahead and that she would stand by him no matter what happened.

Well the first thing he did was to rent a little ramshackle house just out of town with four acres of ground around it. The next thing he did was to plant four acres of potatoes. He figured if the welding business didn't go they would still have potatoes to eat. He had been in the welding business about a year when I saw him and he said that he believed that he had turned the corner. People were beginning to find out that he could do something for them. He had broken even from the start and now was beginning to make a little money which he was putting back into the business.

When we got off the train at the south station in Boston, I said to him—Mister, I am telegraphing our people to ship you the welder you want. You put it into service and if at any time you have any spare change, send it on to Cleveland and we will credit it to your account. That equipment was paid for in full within three months. Today that man is financially independent and is one of the best known commercial welding men in the New Egland States.

Now, it didn't take money for that man to make a success. It didn't take high power technical ability. As a matter of fact he taught History and English Literature. He knew how to do something better and cheaper than it had ever been done before in his locality and he made himself financially independent because he had the courage and will to serve his neighbors.

In closing I am going to tell you how to find the gold in the welding processes. Find a way to do a job better and cheaper than it ever has been done before. Pick the job with which you are most familiar and you will find that the best way of doing it is perfectly obvious and so simple that you will wonder why no one ever thought of it before .

WELDING FEATURED PROMINENTLY AT RAILWAY APPLIANCES SHOW

At the exhibition of the National Railway Appliances Association, held at the Coliseum in Chicago, March 8 to 11th, the following manufacturers in the welding industry were represented with exhibits:

Air Reduction Sales Company, of New York.
Page Steel & Wire Co., Bridgeport, Conn.
Carbic Manufacturing Company, Duluth, Minn.
General Electric Company, Schenectady, N. Y.
Lorain Steel Company, Johnstown, Pa.
Metal & Thermit Corp., Chicago, Ill.
Alexander Milburn Co., Baltimore, Md.
National Carbon Co., Cleveland, Ohio.
Northwestern Mfg. Co., Milwaukee, Wis.
Ohio Brass Co., Mansfield, Ohio.
Oxweld Railroad Service Co., Chicago, Ill.
Rail Joint Co., Chicago, Ill.
Torchweld Equipment Co., Chicago, Ill.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.
Wm. Wharton, Jr., Co., Easton, Pa.

In addition to these firms, who are well known members of the welding industry, a number of the exhibits contained equipment which was fabricated by welding.

Production Welding With the Torch

When Used Intelligently the Oxy-Acetylene Torch Is a Convenient and Economical Tool for the Maker of Metal Products

PRODUCTION welding is an important part of the regular program of many successful job welders. Mr Austin, proprietor of the Austin Welding Works, Chicago, states that he has used welding for production in his shop almost constantly for the past ten years. The present location of his plant is 551-553 W. Quincy street, and it is in this shop that the various articles described below are welded, on a production basis.

The excellent quality of the welding done in this plant is featured in an article printed last month, when all welded pile driving ramheads were described. These ramheads received as severe an actual test under working conditions as can be imagined. They had to withstand 2,500 heavy blows every day they were in service, and under this terrific treatment not one of them has failed.

The Austin Welding Works uses welding whenever it is practical; and does job and contract welding work of all kinds. The photographs reproduced here show the extremely wide range and the variety of work done.

Back in 1917, Mr. Austin was mentioned in *The Welding Engineer* for doing some very good welding on fireless cooker tanks for the soldiers in France. In his little shop, for he was just starting then, he had twelve women hard at work welding on a production basis. In six months they turned out 55,000 fireless cooker tanks. Since that time Mr. Austin has been busily engaged in production work and his ingenious applications of the torch for such work may prove very helpful to any one interested in production work.

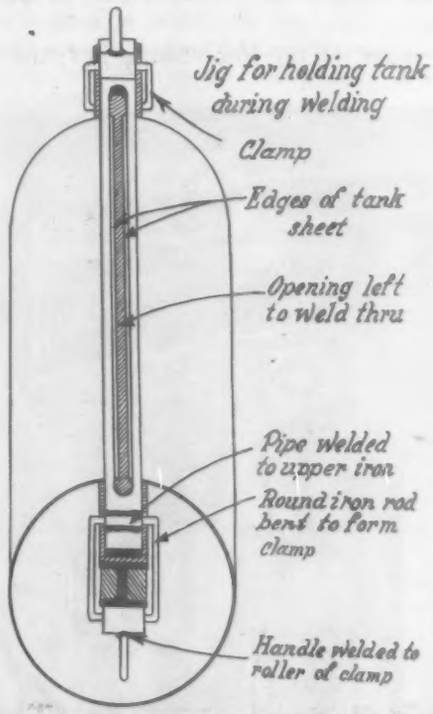
A great deal of the work in this plant is done for the oil burner trade. The illustrations show three types of oil tanks. One of these oil tanks is a fifty-gallon round tank and stand for use with gravity feed burners. This tank can also be supplied with an automatic pump. The tank is of entirely welded construction, while the stand is made of angle and strap iron bolted together, with the exception of where it is welded at the top of the sling for holding the round tank. Here it is welded to the angle upright. The tank has two circumferential welds, one at either end, where the end pieces are welded to the cylindrical part of the tank. All vents, filling holes and fittings are also welded in and the tank has one longitudinal weld.

Another type of tank is known as the double-unit fully automatic oil burner tank. These are made in two sizes, one with a capacity of 256 gallons and the other with a capacity of 296 gallons. The welds on this tank are clearly indicated by the white arrows in the photograph and the tank is of entirely welded construction with the slight exception of the pipe fittings and bolts which hold the pump motor to its stand. There is a great deal of welding on one of these large storage tanks as the side pieces are all welded, the ends are welded and all of the braces are also attached by welding.

The Austin Welding Works also manufactures an automatic 50-gallon capacity oil tank which is used in connection with underground storage tanks. It is mounted on a stand made of angle iron and strap iron bolted together. The tank is of welded construction throughout, for Mr. Austin has found that welding gives an absolutely oil-tight joint which will stand up under all working conditions.

Left—50 Gallon Round Tank for Gravity Feed Oil Burners. Center—Double Unit Fully Automatic Oil Burner Tank. Right—Automatic 50 Gallon Oil Tank. These Tanks Are All Gas Welded Throughout.

Mr. Austin manufactures a standard oil tank with a capacity of 200 gallons. It is also of welded construction with welded flanges and a reinforcing flange that is welded on both sides entirely around the tank; in the center the tank has a longitudinal seam weld and the ends are flanged and welded together. This tank is 84 inches long and 27½ inches in height. All of the production work carried on in this plant is done with the oxy-acetylene process.

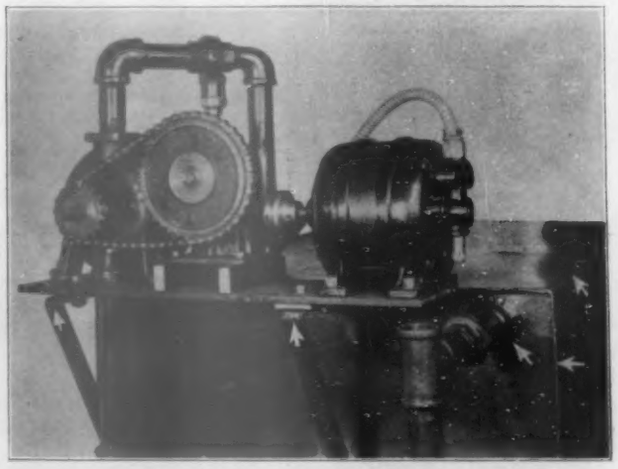

Jig for holding tank during welding
Clamp
Edges of tank sheet
Opening left to weld thru
Pipe welded to upper iron
Round iron rod bent to form clamp
Handle welded to roller of clamp

Special Jig Used in Tank Welding

The line drawing reproduced here explains one of the special jigs they have designed for welding the longitudinal seam of a tank. The jig consists of an I-beam which is a little longer than the tank to be welded. On top of this is a heavy iron bar about 1 inch thick and 4½ inches wide. It also extends beyond the tank at either end. In the center of this upper iron bar there is a groove or slot cut witth beveled edges so that it allows the free use of the torch and welding wire. The opening at the bottom of the groove is about half an inch wide. The cylindrical part of the tank is formed and inserted into this jig, as shown in the diagram. The upper bar is laid along the seam and clamped firmly in position by the two special clamps, one of which clamps downward and the other upward, thus holding the two iron bars tightly together with the edges of the metal sheet just the proper distance apart, or right together as the case may be. In this way it is impossible for the iron to move, twist or warp while it is being welded. The operator has an easy time welding the longitudinal seam by simply manipulating his torch and welding wire down the groove in the upper bar. After the seam is finished a pull on either of the clamps releases the jig and it is an easy matter to clamp the next tank in it. This is a very handy device for use in tank production welding.

Another unusual bit of production welding is the Austin kerosene fired steam table for hot dog stands. These are designed for road houses, lake resorts and other places where gas is not available. They have a vitreous enamel front, a glass service shelf, nickel top, two meat pans with roll or lift covers and two white stone jars with nickel tops. These steam tables are 25 inches wide, 33 inches high and weigh about 600 pounds. They are of welded construction throughout. All joints, seams, braces and shelves are oxy-acetylene welded. Along this same line Mr. Austin also makes hot dog grills from ½ inch boiler plate. The dimensions of these grills are 12 inches high by 18 inches wide by 36 inches long. Wherever a joint is necessary oxy-acetylene welding is called upon to do the work.

Still another novelty which Mr. Austin welds, but hardly on a production basis, as there are only fifteen in use, is the Austin Vibratory Bed. This was developed upon the special request from the medical profession. The frame work of this bed is made of iron pipe welded together at each joint. The ends of the pipe, where the castors go and where the knobs are placed in the top, are filled in by welding and are reamed out to the proper size. The top of the bed has welded corners. The



Close-up of Welding on the Double Unit Automatic Oil-Burner Tank

braces for the electric motor and the cross bars are all welded in place. Even the spring plates for the rubber covered coil springs are welded firmly to the frame.

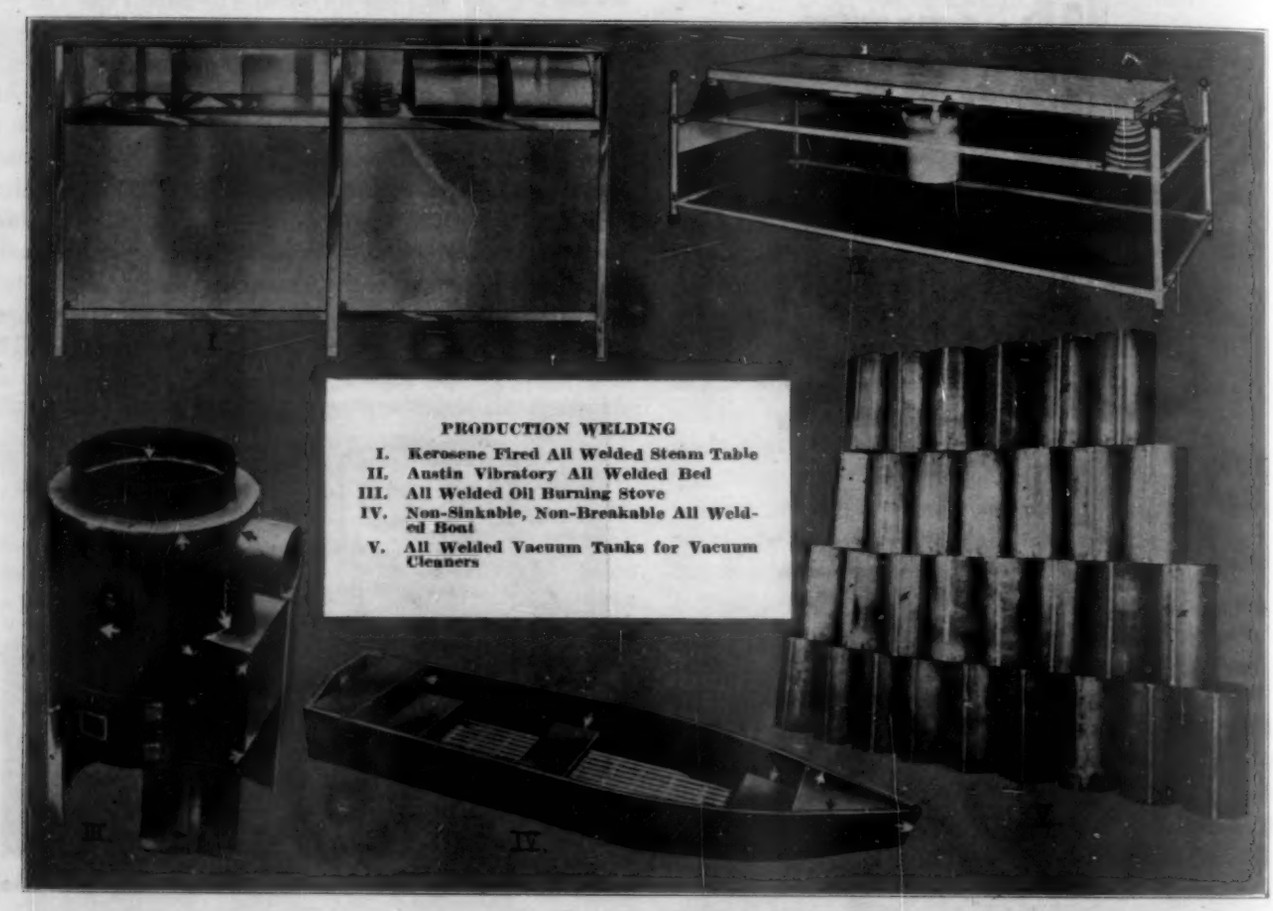
The oil burning stove is another product which is welded in large quantities, the orders coming through in lots of 100 about every two or three months. This stove is particularly interesting because it is entirely welded. The upper part has two heavy welds running entirely around it. There is a long longitudinal weld and the hole in the door is cut out with the oxy-acetylene torch. The pipes are welded in place and in fact the only places where bolts are used is where the hinges are bolted to the stove and to the door.

Here's another unique product. The river dredging companies on the Fox River and other rivers throughout Illinois and lower Wisconsin called upon Mr. Austin to produce a non-sinkable, non-breakable all steel boat.

These he has turned out in quite large quantities. One concern uses ten of them. Air chambers are built in and welding is used to make absolutely air-tight joints. The matertial used is 16 gauge steel throughout. The air chambers are located at each end of the boat and the boat is also equipped with slatwood removable bottoms. The backs are built up and reinforced with welded braces so that outboard motors can be clamped to them. Wherever metal is joined to metal the oxy-acetylene process is used and these boats have, on an average, 50 feet of welding.

turns it over to one of his competent welders and tells him to go ahead. The man then figures out how the work should be patterned to handle it in the fastest and most economical manner. If jigs are necessary he designs them and makes them. If they are unnecessary he goes ahead and does the welding as it is called for. Often the jigs from one job will fit another but from the large number of jigs and patterns which adorn the walls of the Austin Welding Works one can see that practically every job has its specific requirements and needs specific attention.

There is no set rule for making jigs; the only rule


PRODUCTION WELDING
I. Kerosene Fired All Welded Steam Table
II. Austin Vibratory All Welded Bed
III. All Welded Oil Burning Stove
IV. Non-Sinkable, Non-Breakable All Welded Boat
V. All Welded Vacuum Tanks for Vacuum Cleaners
III.
IV.

One of the largest orders that is steadily turned out is for all welded vacuum cleaner tanks made of 18 gauge stock. There are two Chicago firms for which these are made and they are produced in quantities of 500 or more to the order.

In all this production work Mr. Austin stresses the importance of clearly thinking out the method of procedure and the proper way to systematically lay out the patterns for the various parts to be welded. Next in consideration comes the matter of jigs and holding devices, one of which has been described. They are too many in number to describe here, for every job has a special series of jigs. These follow no standard line of construction. They are merely the invention of the man who is doing the work.

When Mr. Austin gets a production welding job he

according to Mr. Austin, is the rule of common sense. By this he means that it is up to the man to give the particular job at hand a great deal of thought before he starts welding. In this way the work is carried on in an economical and efficient manner. The hit or miss method of doing production work does not meet with any approval with Mr. Austin. All of his men are capable of handling a production job from start to finish with very little supervision, although he is always willing to help them in any way.

The articles which have just been described are only a few of the vast number which have been turned out in this shop. A trip through it would surely be a revelation to manufacturers who are unfamiliar with the wonderful work which oxy-acetylene welding can turn out on a production scale.

Resistance Seam Welding

Progress Made in the Construction of Machines Promises to Improve Many Products now Assembled by Riveting Method

By W. H. Gibb*

THE term "seam welding" is applied to that process of resistance welding by which the overlapped edges of two pieces of sheet metal are joined in a continuous weld, without the addition of any other metal. This process is sometimes called line welding.

Introduction

As a background for what is to follow, I shall review briefly the method or cycle used in making a resistance weld. The term "resistance welding" for practical purposes embraces butt welding, spot welding, and seam welding. We need not concern ourselves, however, with the butt welding operation in a consideration of the subject of seam welding, but since the seam welding operation was developed directly out of the spot welding operation, I shall briefly indicate the steps taken in producing a spot weld. The simple essentials of a spot welder are a transformer properly housed, having a secondary capable of carrying a heavy current without heating, an upper and a lower welding horn provided with suitable welding electrodes, preferably water cooled, and a means of applying pressure to the weld which is made between the welding electrodes. The welding cycle itself is simple. First, the sheets to be welded are placed between the electrodes, overlapping each other to such an extent as the requirements of the work indicate. Sufficient pressure is then exerted to bring the sheets into contact with each other. The primary circuit of the welding transformer is closed, causing a high amperage welding current to flow in the secondary. The sheets are heated to a plastic state because of the resistance to the flow of current at the point of contact. The current is then switched off and a final welding pressure completes the cycle.

The Seam Welder

The conception of a seam welder, by one familiar with the spot welding operation, was a rather obvious step, and it was not long before the idea of making a continuous weld between two revolving electrodes or between a revolving electrode and mandrel or welding horn, with the work interposed, was conceived and given practical tests and application. It was shortly discovered that the old method of welding in the way that it was first conceived and used was applicable only to short seams and to entirely clean metal. The attempt to weld any but short seams resulted in the accumulation of heat that interefered with the success of the operation to an extent in direct proportion to the length of the seam. A good weld could be made at the beginning of the seam but before the end of the seam was reached, heat had accumulated to such an extent that the metal was burned. In addition to the difficulty of burning the metal, the welding rolls become pitted and oxidized from the too high temperature so that they could not be used for further welding until cleaned, thus greatly retarding the operation and adding to its cost.

The Step by Step Seam

For some reason this particular field was practically neglected for a great many years. This was probably due to the difficulties mentioned which, no doubt, seemed almost insuperable to the pioneers in the field but it is safe to say that if this method of welding had had the intensive study and experimentation that was given to other branches of electric welding, progress would have been much more rapid. The actual fact is, however, that the process of seam welding remained at a stand-still for many years with only a few practical applications. Comparative inactivity in this line may be said to have continued up to the year 1921. At that time our company had an agent in Europe, whose duties on our behalf were to advise us of any developments in the welding field. Among other things, he sent us details of a machine brought out by a German manufacturer, known as a roll-step or step by step seam welder. Upon receipt of this information two representatives of our company took a boat at New

Battery of Seven Welders Making Ice Cream Cans

York for Germany to investigate this new development. We found these machines to very closely resemble, in appearance, the continuous seam welder up to that time in use, inasmuch as two welding rolls were used or a welding roll and a mandrel. The machines differed, however, in the driving mechanism which consisted of an eccentric actuating a pawl and ratchet arrangement. By this means the driven welding roll moved periodically and the whole welding cycle was briefly this: as the welding roll came to rest on the seam, the current was automatically switched on causing the metal to be heated to a plastic state. Then the current was automatically switched off. The pressure of the water cooled welding rolls squeezed the material into a homogeneous union and tended to solidify the weld. The roll then moved a fraction of an inch to the next step. When the rolls came to rest the same welding cycle was repeated. It will be observed that during the time the rolls were in motion and when the work was moved between the rolls, there was no current flowing. Patents were taken on this method of welding, both abroad and in the United States. Our representatives made a contract for the sale of this equipment in the United States and a number of the machines later sold by us are still in regular operation in this country. The claim was made by the German manufacturer that these seam welders would weld ordinary commercial sheets without removing scale by pickling, grinding, or any other method. This claim was either a misrepresentation or a case of "over optimism" as you please. This type of machine, being in a sense an automatic spot welder, could successfully weld stock lacking something of being entirely clean but it was far from true that ordinary one-pass sheets could be welded. Our own acceptance of the manu-

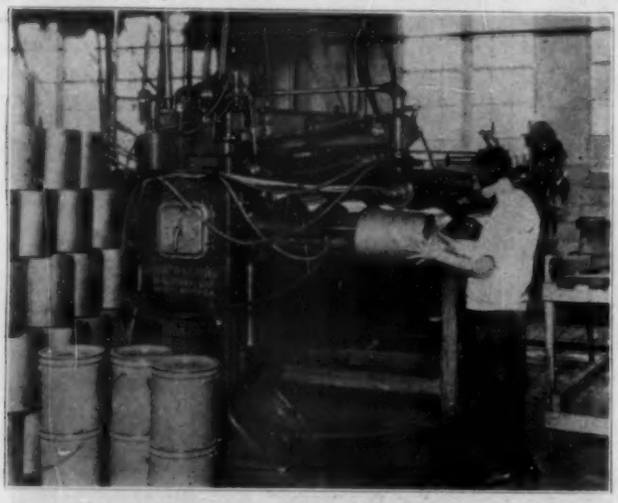
*President, Gibb Welding Machines Company.

facturer's representations got us into some little difficulty but I believe we have lived it down by this time.

This new method of welding was a distinct step in advance since it permitted of welding heavier gauges than had heretofore been possible and extremely careful cleaning of the stock was not necessary.

Importance of Clean Stock

I will digress a little here. I should like to make further comment on the matter of cleaning sheets, both as applied to the spot welding and seam welding operations. Anyone familiar with the spot welding operation will know that with the proper pressure and heat a single spot weld can be made



Side Seaming Ovens

successfully on one-pass material. This result is not always obtained and the weld is never as nice in appearance as on clean stock but in the practical application of the spot welder, a very considerable amount of scaled or dirty stock is welded. At the same time, experience proves that this is not a thoroughly practical production proposition; chiefly because frequent cleaning of the electrode points is necessary since the oxide of the sheet will imbed itself into the copper. The reason for this is that the contact between the copper and the top of the sheet is so imperfect, because of the oxide, that almost as much heat is created at this point as between the sheets. This brings the surface of the sheet to a semi-plastic state and also heats the copper. Therefore, it proves an easy matter for the particles of steel and oxide to unite with the copper under pressure. This is frequently augmented by the fact that the surface of the one-pass sheet is rough and considerable arcing is experienced, particularly after a few welds have been made. In other words, unless the points are cleaned practically with each weld, the sheet will be pitted or burned. The welds themselves will be of questionable value, so far as strength is concerned, for the reason that the oxide is imprisoned in the weld, preventing a clean metal to metal union.

Reverting to the roll-step method of seam welding, it is obvious that the making of a series of spot welds, each overlapping the last so as to produce a continuous seam, could not be as rapid an operation as the older method of continuous welding. The advantage of the method did not, therefore. lie in an increased speed. On the contrary, speed was reduced. The advantages were that seams of any desired length within the limits of the machine could be made without the drawback inherent in the old type machines of accumulation of heat in the welds. The fact that heat does not accumulate in the roll-step method of welding, of course, lies in the fact that the current is interrupted at regular intervals. A fair average of speed for the roll-step machine would be about 150 feet per hour. We produced seams on lighter stock at a rate as high as 180 feet per hour.

The "Dual Speed" Method

A study of the roll-step machine led to the development, by our own engineering department of a type of machine somewhat on the same order but differing in that the welding rolls were never brought to a complete stop but were revolved alternately at a rapid speed and then very slowly. This was accomplished by means of eliptical gears in the mechanism actuating the welding rolls. This proved an entirely practical machine and slightly increased the speed of welding over that developed by the roll-step machine. It is characteristic of the rapid developments of seam welding in our own organization at that particular time that this new type, which we termed the "dual speed" seam welder was never put on the market; this for the reason that a further important development came right on the heels of our experiments with the dual speed machine. This development consisted of the discovery that the interruption of the current alone was equally effective in producing good welds, whether the work was stopped, slowed down, or run through continuously. The seam welding machines operating on the current interrupter principle are similar to the continuous seam welders in that the welding speed is high and no strain is put on the mechanism by the abrupt stopping and starting of welding rolls. They combine with this also the features of the step-by-step method in that the current is interrupted rapidly. This permits of surge of welding current and a subsequent cooling period. To go back for a moment to the continuous seam welder, when the current is reduced to a value which will not injure the metal, the metal is frequently only sweated or insecurely stuck to welding pressure, the stock is frequently burned and pitted for reasons that have been mentioned. On the other hand, if current is reduced to a value which will not injure the metal, together. With a proper mechanism for interrupting or breaking the welding current, burning and pitting can be entirely eliminated and the welding speed, proper to the gauge of stock to be welded, can be maintained throughout the full length of the longest seam. With our seam welders of today, using the current interrupter mechanism, the speed of welding ranges from four feet to thirty feet per minute, depending on the gauge to be welded.

Automatic Operation

The machines of today are automatic in their operation; that is, the current is automatically switched on and off and the work requires no more than guiding by the operator along the seam. To describe the machine would say that as you see, it resembles a large sized spot welder in appearance and the electrical equipment and electrical characteristics, aside from the interrupter mechanism, are not greatly different from a spot welder. A laminated secondary connects the upper welding wheel directly to the transformer and the same method is used to connect the lower welding horn to the transformer. The upper welding wheel, under ordinary conditions, is driven by means of an electric motor and mounted on the top of the machine. The speed of this motor is controlled through worm gears and a set of change gears. These change gears provide different speeds at the welding roll for different gauges of material and for different kinds of material. In what might be termed a standard machine, provision is made to quickly change the roll arrangement from the straight seam to the circular seam. In other words, the side seam of a container can be welded and by simply changing the lower arm, which is held in a sleeve and swiveling the upper roll ninety degrees, it is possible to also weld the bottom of the container into the shell.

I have mentioned above a standard machine, but to be frank, we could hardly be said to have any standard machines. This machine comes as near to being a standard machine as possible. It welds both straight and circular seams and is

applicable to a considerable variety of work. It is the type of machine that is usually installed at plants where the work varies to a considerable extent. Such a machine as this will come nearer to meeting all the conditions of such work than any other single type. The best results in seam welding, however, are to be obtained, not by building a standard machine but by building each machine exactly for the job. The machines so far shown have the widest field of application and in fact have quite a field of application by simple changes in arm lengths, sizes of electrodes, etc. We prefer to use this type machine and we designate this type the "stationary roll type" wherever possible because of its uniform electrical circuit. There are quite a few jobs however which will not lend themselves to the use of this type of machine.

Various Types of Machines

In what we call the TR machine, instead of the work traveling, it is clamped down and the roller electrode traverses the seam. This type of machine is advised on small diameters of lengths in excess of 12". The cylinder is placed over a mandrel which mandrel is not indicated in the slide because of the clamps. The mandrel is machined to the exact diameter and by means of the clamps, definite laps are maintained.

There is still another type known as the moving slide machine. Its particular application is in cylinders of small diameters and short lengths. The upper electrode remains stationary. The cylinder is placed over a mandrel which moves in and out and is connected to the source of current.

The seam welder has a very wide field of application. Among the applications might be mentioned lead kegs, small tanks, ovens, automobile mufflers, automobile heaters, automobile fenders, automobile bodies, automobile filters, garbage cans, oil delivery cans, steel barrels, ice cream cans, railroad torches, oilers, gas heaters, coffee pots, oil stove parts, thermos bottles, electric washer tubs, monel metal work, (textile) and ice box linings.

Operating Questions

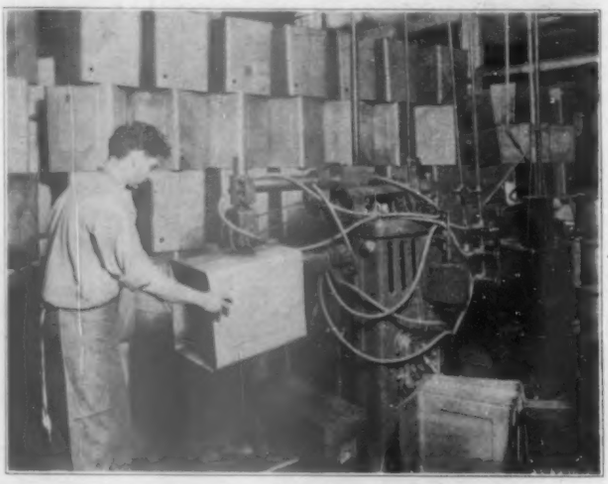
There are very logical questions which naturally arise in connection with seam welders, such as, "What is the power consumption?" This is rather a broad question and is dependent upon so many factors such as gauge of material, speed of operation, and above all else, comparative loading and welding time. It is seldom that an installation will run over 8 KWH per hour and seldom under 4 KWH per hour or an average of 6 KWH per hour, which, at 3c per KWH, would amount to 18c per hour.

Another question which is frequently asked us is, "How fast can you seam weld?" This also is contingent upon number of factors, such as gauge of the material, how strong and to what extent must the seam be leak-proof, how accurately is the work being held in its passage through the rolls, and so on. On one of our highly developed machines on which there is a very accurate gauge and jig used, it is possible to attain an extremely strong, leak-proof seam at the rate of 40 feet per minute. A machine of this speed, however, must be made for one single product and for large production in that product. Machines are usually provided with a speed of approximately 9 feet per minute on No. 18 gauge metal. The speed must of necessity be materially decreased on any gauge heavier than No. 18 gauge.

Increasing Production

It has been possible to very nearly double the production of our early installations of seam welders through the use of a special spot welder equipped with a gauge block by which a shell may be spot welded prior to the seam welding operation. The first thought of a manufacturer when this spot welding operation is mentioned is that it adds an operation. As a matter of fact, spot welding is no more of an operation than is the operation of putting the shell between clamps or spot welding on to the seam welder itself, and since the especially equipped spot welder can do this operation of jigging or clamping faster, the use of spot welders for such a purpose is only logical.

An important thing to be remembered regarding seam welding and spot welding as well is that a great deal of bad results are eliminated by insisting on clean stock. Seam welders



Welding Paint Pails at 1¾ Inches Per Second

have successfully welded steel, terne plate, tin plate, light gauge soft brass, zinc, nickel, monel metal, nickel silver and various alloys in production. They have also successfully welded galvanized stock but it has never been recommended for production for the reason that the spelter adheres to the rolls and causes difficulty. We are working on a means of overcoming this. A peculiar thing in connection with the welding of galvanized stock is that the welds do not rust.

Various gauge sheet from No. 30 gauge to No. 16 gauge have been welded in production. It is entirely likely that even heavier stock can be seam welded successfully.

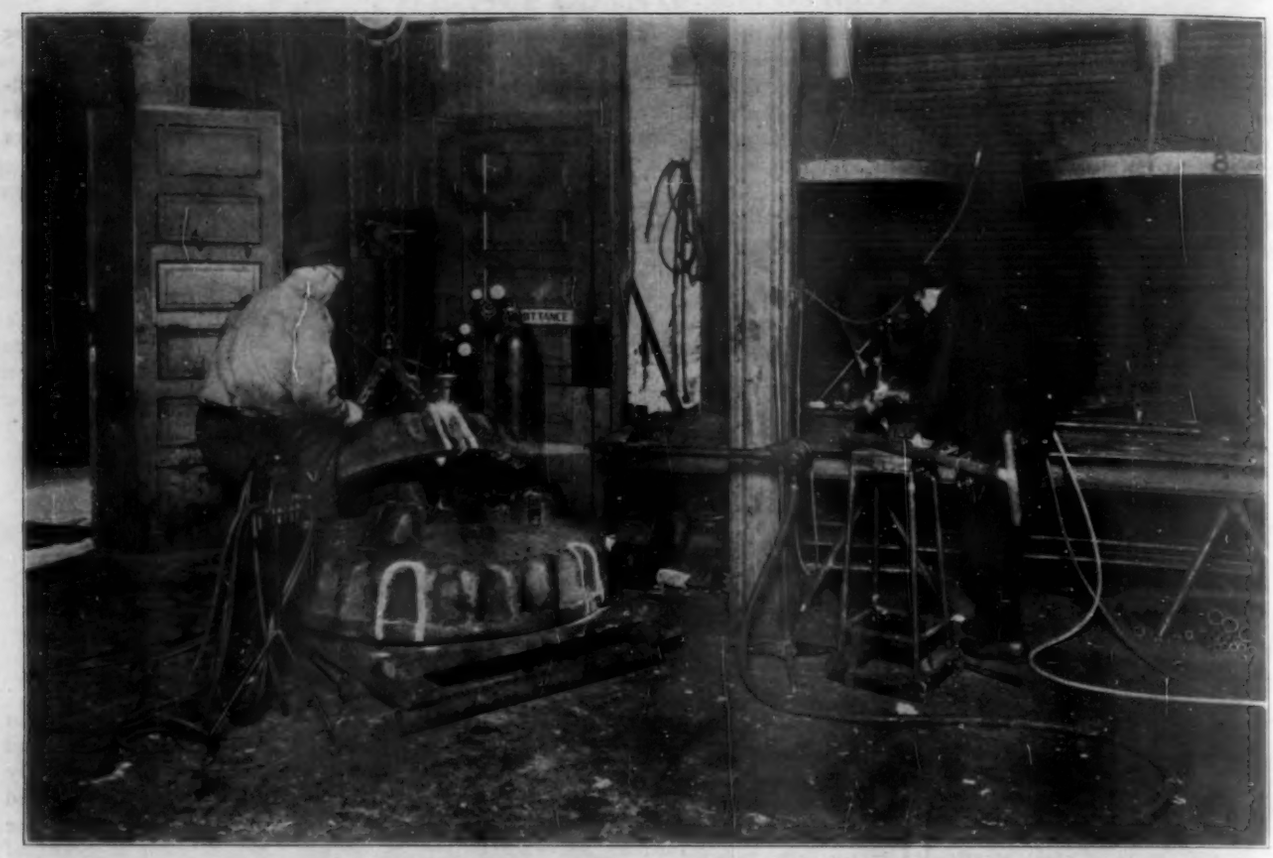
One of the biggest features in connection with the successful installation of seam welders is the engineering service upon which we insist. Good seam welding is a product of the proper amount of heat, the proper amount of pressure and the proper speed. It is necessary to adjust these three variables to suit the job. It cannot be prescribed as in a text book but has to be worked out on the job. After the machine is set it will be seen that there are no variables either mechanical or electrical. Identical conditions are applied on each weld with a subsequent duplication of results.

LOS ANGELES SECTION LEARNS ABOUT HYDROGEN ARC WELDING

The program for the March meeting of the Los Angeles Section of the American Welding Society, scheduled for March 16th, was a paper by Mr. D. H. Deyo, of the Arc Welding Engineering Department of the General Electric Co. The two main points of his discussion were to be Automatic Arc Welding and Welding in Hydrogen Atmosphere. Mr. Ardouin, Secretary of the Los Angeles Section, is promoting the Society work in that district very effectively and his invitations to the monthly meetings make regular attendance seem like an attractive proposition.

CLEVELAND WELDING SCHOOL EXPANDING

Mr. E. T. Scott, former Cleveland representative of the Burdett Manufacturing Co. of Chicago, Ill., has entered the employ of the Cleveland School of Technology as assistant to Mr. Reginald K. Randall, superintendent of the Welding School. Mr. Scott, before entering the employ of the Burdett Manufacturing Co., was employed by the Hydraulic Pressed Steel Co., Cleveland Tractor Co., and the Cylinder Salvage Co. of Cleveland. The increased demand for welders has made it necessary to increase the full-time staff at the Cleveland school.



Left—Welding Cracks in Magnet Shells. Right—Welding Jack for Unloading Automobiles

Using the Nickel Steel Filler Rod

This Shop Finds That Nickel Steel Is Good Filler Material for Welding on High Carbon Steel Castings

MANY articles which have been written on the subject of oxy-acetylene welding have mentioned the nickel steel rod very favorably as filler material and there are many welders who have a distinct preference for it for quite a bit of their work. That it is good material to have on hand in the welding shop is illustrated by the work shown in the accompanying photograph. The picture was taken in the shop of the Wisconsin Welding Company, Milwaukee, Wisconsin, which is operated by the Universal Oxygen Company, of that city, and shows a welder at work on the repair of magnet shells weighing about 3 tons to 3½ tons each.

These magnet shells are made out of high carbon steel. They are quite large in diameter and the cracks are such as occur as the result of some unusually severe accident or as the result of shrinkage.

Although the flame does not show up very strongly in the photograph, it will be noted that a preheating torch of the gas-electric type is being used to keep the work warm. This type of preheating torch is used in a great many welding shops for first class work, and in this case is used both for preheating and keeping the whole job warm until the welding is finished.

In view of the thickness of the casting, which amounts to about 3 inches in the thickest and about 1½ inches in the thinnest section, it is necessary to apply the metal in layers. The crack upon which the welder is working is about 8 inches long. There is no objection to applying the metal this way, because it is kept continually hot and a good welder can unite the successive layers just as easily as the poor welder can plaster it on. Nickel steel flows very readily and requires no special kind of application. The rod used on this job was of the Purox make. The quarter inch size was used throughout and the operator used an Unoxco torch with a No. 12 tip.

It has been estimated that a casting of this kind, including the machine work, which amounts to a considerable item on this particular piece, would be worth approximately $250.00. The cost of having it welded was about $40.00, that is, in the neighborhood of one-sixth of the price of replacing it with a new casting.

The magnet on which this casting is used would probably lift about 2 tons and the weld will be subjected to extremely hard and rough usage. These magnets, being handled by a crane, and not very carefully, are usually dropped on the metal which is to be lifted. The weld, therefore, must be uniformly strong if it is to hold up and it is reported that so far the welded shells have given perfectly satisfactory service.

Another welder in this picture is working on a production job. He is welding jacks, which are used for unloading Ford cars. Mr. S. H. Smith, Manager of the Milwaukee plant, states that they have been producing this article for a number of years and that while they do not go in for production work on a big scale there is always enough of it to keep a couple of welders busy.

Arc Welding Bronze Runners

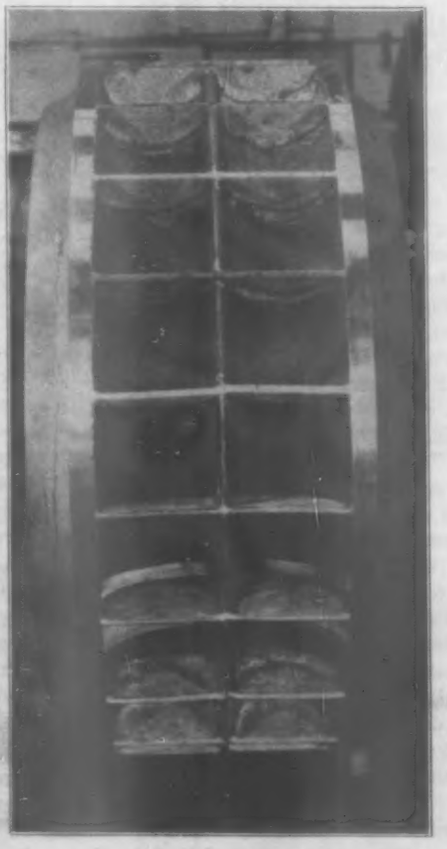
By B. F. Lee*

THE Niagrara Falls Power Company has been repairing its water wheel runners for several years by both acetylene gas and arc welding processes. Bronze runners whose buckets are broken off or worn away or may have holes eroded entirely through them are now repaired and brought back to or near their former efficiency with many years of useful life in prospect, where 10 years ago these same runners would represent only their weight as junk.

Two photographs are reproduced here, one showing a 10,000 h.p. double discharge bronze runner whose buckets were broken off on the inflow ends in some cases as much as 3", while on the outflow side some were broken off. Many had holes eroded entirely through them and all required patching.

This runner was first placed on a boring mill and a widened out V-shaped cut was machined across the inflow face of each set of buckets, thus providing a cavity of uniform size on the inflow blade of each bucket. Pieces were then cast from similar bronze metal to fit into the cavity machined from the buckets. The edges of these bronze pieces are cast chamfered so that when they are fitted into the cavity there will be a V-groove all along the welding surface. In repairing runner buckets that have holes eroded clear through them, a wooden block formed to fit th bucket and a piece of flexible asbestos about ¼" thick are clamped between the wooden block and the bucket to be repaired. This gives the proper form or background to build up on.

Bronze Turbine Runner Repaired by Welding in Bronze Patches



Showing Bronze Castings Welded to Buckets

On this particular 10,000 h.p. runner about 150 pounds of bronze welding rod was used. The entire cost of the work was approximately $500.00, whereas a new runner would cost between $3,000.00 and $4,000.00. The 5,000 h.p. single discharge bronze turbine runner was so badly eroded on the outflow side of the bucket that it was necessary to machine off about 8" of the bucket in order to get back to sound metal where the newly cast bronze pieces were welded into position. The photograph in this case shows about half the cast bronze bucket ends welded into position. The repairs on this 5,000 h.p. runner cost $426.00, whereas a new runner to replace it would cost $3,500.00. 200 pounds of bronze welding rod was used.

This company has done much bronze welding with arc welding machines using 60 volts and 200 amperes, but the welders can do better work on bronze runners with a machine capable of delivering 300 amperes at about 66 volts. In bronze welding the electrode is made positive which is the reverse from the general practice on iron and steel.

*Manager Electrical Department, Niagara Falls Power Co.

Welding at the Hawthorne Plant*

Variety of Work for the Torch in the Plant of the Western Electric Co., Where Quality Is the Watchword

By E. L. Swangren†

WELDING, as we understand the term today at the Hawthorne Plant of the Western Electric Company, dates back to about twelve years ago, when I was assigned by the foreman of the millwright shop to assist two gentlemen who had arranged to bring an oxy-acetylene welding and cutting outfit into the plant for demonstration.

My interest was very much aroused when a bolt attached to the chain for holding the tanks on the truck was found broken and one of the men setting up the outfit remarked in a most matter-of-fact-way, "We will have to weld that first." I watched every move he made, from the lighting of the torch through the whole operation of making the first oxy-acetylene weld I had ever seen, to the time when he said, "Let it cool and it will be all right."

When that bolt had cooled off I examined it with the greatest care, and tried its strength to see if what the operator had said was true. It was. The bolt was whole again, and apparently as good as ever, and from that day to this I have been sold on oxy-acetylene welding.

A few days before this outfit was brought into the shop we had started taking down a steel trestle-bridge leading from our boiler room to the belt line railroad tracks and running through the center of the plant. This trestle-bridge was used for conveying coal from the storage bin to the coal bunker above the boilers. It was being cut down in the old-fashioned way, with cold chisels and sledge hammers. I was told to go on the job with a cutting torch to see what I could do. I cannot tell you how many men there were on this job when I arrived, but I do know that at least half of them were taken off soon after, and the other half had plenty to do to move the old iron out of the way. I had been told when I started that the outfit was on a thirty-day trial, so I was doing my best.

After it had been on the job three days the foreman told me that it was not going back. That was the beginning of oxy-acetylene welding and cutting at the Western Electric Plant. Since then it has grown from a one-man job to a department using eighteen welding units and three cutting units at the present time. This does not include the large amount of gas welding apparatus used in the experimental and engineering departments.

Today we are called upon to weld anything from the smallest pin to one of the mammoth punch presses, a great many of which we have in our plant. Almost every day new uses for welding and cutting torches are found, and it would take considerably more time than is available here to give a complete story of the many ways welding is saving time, labor, and money at the big works.

I should like to mention one instance, however, which will give you just a little idea of some of the things we are called on to do. Of course, we have been welding wrought iron, cast iron, steel, copper, bronze, aluminum and the regular line of alloys for a number of years, such as you would expect to find in a plant like ours, but occasionally a problem comes up that is not easy to solve. Not so very long ago one of our development engineers came to our department and asked me to weld some pieces of a dark gray metal he had in his hand. This metal was unlike anything I had ever seen. In spite of its dark color it had a shiny surface and an altogether different feel to the touch. Curiosity prompted me to ask the engineer what it was.

"Permalloy," he replied.

"What's permalloy?" I asked. "What is it made of? What is its composition? Tell me something about it, so I can figure on how to handle it."

"No chance," he told me.

He proceeded to explain that Permalloy was a new metal with which they were experimenting. Its composition was a secret, but it had to be handled in a certain way if they were were going to use it. The metal had to be welded and rolled, and then welded and rolled again until it was down to the desired thickness, and if we could not weld it they were up against it.

In our department we do not concede that anything is impossible without giving it a thorough trying out. So I told the engineer to leave it, although I felt that we were working in the dark. We tried everything we knew how to weld that metal. We heated it every way we could, and used every kind of flux we could find, with the same result; as it cooled the surface of the weld would become badly checked with small cracks, and in some instances the metal was so brittle that the welds cracked in two when the piece was dropped on the floor.

Frankly, we were up against something we did not know how to handle. I was just about ready to report that the metal could not be welded, when one noon, after I had secured another supply of samples from the Engineering Department, we were heating a piece over a slow fire and had sprinkled it with borax to watch what that would do, when one of my men, picking up a salt cellar he had left on his bench, said, "Let's give it a dose of salt." More by accident than anything else the top of the salt cellar flew off, and a liberal sprinkling of salt mixed with the melting borax. This mixture covered the metal with a yellowish jelly-like substance as it melted. We did not even bother to clean it off, but began to weld. You can easily imagine our surprise when we saw this yellowish semi-fluid substance following our weld and covering it so as to prevent the air from reaching it. Our problem was solved! By an accident, it is true, but the weld was a good, tough weld, and it was only a matter of a little experimenting to find the right mixture for a new flux, and Permalloy was and has been welded in the Western Electric Company ever since.

Such instances, however, are only a small part of our work. Difficult forgings, particularly those having sharp exterior angles, are built up by the welders and then finished by the blacksmiths. Punch press dies that have become badly worn are rebuilt by welding, and machine parts—such as pulleys, gears, shafts, and pinions, are made a good as new.

One of the most important uses we make of oxy-acetylene welding and cutting apparatus is the fitting and welding of pipe joints, especially large sizes, to convey air, oil, water, and steam. As a result threaded joints are rapidly being replaced by welded ones in our Power House, because we have found them better. It is easier to weld new branches to mains, because we can weld them in at any angle, or make any odd sized reducer or special fitting which may be necessary, than it is to try to assemble them in the old way.

Strange as it may seem, newly purchased machinery many times gives the welding shop something to do, because we often find it necessary to add certain attachments or make other alterations in machines to adapt them to the job for which they are intended. For such work there is no rival to the welding torch. Riveting is also fast going into the discard at Hawthorne Works.

**Paper read before Gas Products Association Convention, January, 1926.*

†Welding Supervisor, Western Electric Co.

Tank angle iron frames, trucks, steel doors, seals, windows, cabinets, metal furniture of all kinds, and structural steel shapes, formerly required fitting and shaping, but are now put together in a better manner without the use of a single rivet. The old methods of making gear guards, by riveting sheet iron to a piece of angle iron which had been previously shaped by a blacksmith, costs about twice as much as it does to make them by welding.

The Western Electric Company insists that Western Electric quality must not be confined to the product which they sell, but that anything which is made for their own use must be built up to the same standards as their merchandise. Everything we make in our Welding Department must meet blue print specifications. Drawings are furnished for practically all of the work which we do, and the finished job must be within certain definite specified limits given on the blue print, if it is to pass inspection. For instance, we make a great many gear guards. The sheet metal for these is cut to size and shape in our tin shop and sent to the welding shop, together with the blue print, where the welder, following the instructions given on the blue print, assembles these parts into the finished guard, welding all joints. All welds must be smooth. The guard must be set up square, and when finished measure up to the dimensions called for in the blue print, within a tolerance of 1/16", and free from buckles.

Another item, of which we make a great many, is the different types of trucks used all over our plant for carrying parts from one operation to another. When making these trucks we receive the raw material and an order, together with the blue print from the Layout Department. The material for these trucks comes in 18 and 20 ft. lengths. When this job is received in our department the supervisor turns the print, together with the proper material, over to a welder, and it is then up to him to build the truck. He lays out his work according to the drawing and cuts and bends and welds every part, as specified on the print, until the whole truck is assembled. It is then turned over to the Inspection Department, where it is examined carefully for defects of any kind. If it is not up to the specifications in every way it is returned to us, and it is up to the welder to make it right, regardless of the size of the job.

Before we go into some of the big jobs which we do at our plant I should like to tell you something about our welders; the way we train them, and how we do our work. Our experience has shown us that most of the welders we hire from the outside know but little more than how to light and shut off a torch, and possibly weld one or two kinds of metal, with but indifferent success in most cases. They know little or nothing about the function of the apparatus, and nothing at all about welding any kind of metal other than cast iron or soft steel.

When we hire a welder, after he is passed through our personnel department, he is turned over to the supervisor, who assigns a welding outfit to him. This welding outfit is kept in a box which has been made for that purpose, and is equipped with a lock and key. This outfit is his to keep as long as he works for us. He is responsible for it, and is expected to report immediately to the supervisor any defect which may show up in the equipment at any time. He is also instructed fully as to the function of the regulators and torch. We do not require them to handle the torch in any particular manner so long as they produce a good, sound, weld and turn out a reasonable volume of work.

Another thing we find, when hiring new men, is that they know little or nothing about blue print reading. Neither do they understand the use of a square or a rule, so most of them find it rather difficult at first to measure up to our requirements. This condition, however, is soon overcome with the help of our supervisors, who are instructed to do everything they can towards educating our men to work our way. And so it follows that the welder soon begins to feel at home, and, what is possibly more important, that his work becomes more interesting from day to day, because he is learning something new and of constructive value, and is doing something besides just welding two pieces of metal together.

While we leave it to our men to use their own initiative, so far as possible, and carry out instructions shown on the blue prints, still, if there is any doubt, the supervisor is always there to show them anything they might wish to know and help them whenever necessary. You would be surprised if you could see the way in which our men respond to this sort of treatment. Based on the experience of quite a number of years, we have found that it pays, not only in the quantity and quality of work which we receive from our men, but in the spirit they show in whatever they do. We believe such training and consideration bring to our organization one of the highest rewards we receive for any effort we put forth in our plant for better work, in the spirit of cooperation and fair dealing which we arouse in our men and which goes with them even after they have left our employ. To such men no job is too big.

Earlier in this talk I mentioned pipe welding as an every-day occurrence in our plant. We have had a great many very interesting jobs to do along that line, but there was one job in particular which we undertook some time ago, and which I believe is worth mentioning at this time. We have two 10" pipe lines, about 75 feet long, running through our Power House. These pipe lines, as they were originally installed, were so close to our electric control board that they interfered quite seriously with the convenient operating of this board. So it was decided that they should be moved 8" further over from the board.

This meant that there were sixteen 10" pipe connections between these pipe lines and the air compressors and heaters which would have to be shortened 8". The steam line carries 120 pounds pressure. To do this work all at one time would require a complete shut-down of our plant, which, of course, could not be considered. It was therefore decided to do this work in two sections—that is, to move one pipe line at one time, and the other a week later. This necessitated cutting out eight 8" sections from the 10" steam pipes which connected the steam line with the compressors and heaters.

We started at 7:30 one Sunday morning and soon had 8 sections cut out from the connecting lines. After a little difficulty in lining up the joints we tacked them together in four places with 3/16" openings between the ends. From that point on, evertyhing went fine, and it did not take long to complete these joints. By 10 o'clock that night we had eight steam lines completed and tested, ready for service the next morning. The following Sunday we took the exhaust or return lines and finished them in the same amount of time. This work is still in perfect condition, and giving as good satisfaction today as it did the day after we finished it.

But all the work we do at the Western Electric Plant is not always done under such favorable circumstances as this job. I remember only too well an outdoor job which we had to do when the weather was below zero. Late in the afternoon of one cold winter day the air line which runs from our boiler room to our Lumber Yard and our Dry Kiln, ⅜ of a mile long, burst. This air line supplies air for our pneumatic locomotive, which is used to haul lumber from the yard to the dry kiln. This work would be seriously hampered if it were out of commission.

A hurry-up call was sent to our department, and we went over to see what could be done. The ground was frozen solid, and the break was at the end of one of the ties of the railway. After a little study it was decided that a hole must be dug in the frozen ground big enough for the operator to get under the pipe, so as to make a proper weld. Laborers were put to work that night thawing out the ground, and by morning they had dug a hole large enough for one of our men to work in. A tent was erected over the place where the work was to be done, in order to shut out the cold wind which was whistling down through the yard, and a salamander was fired up in the tent to keep it warm as possible. A 12" section was then cut out of this pipe with a cutting torch and a new piece fitted in and welded all the way around. By six o'clock that night a test of 1,100 lbs. was applied to this pipe and our work was found to be perfect.

When the coal chutes leading from the coal valves under our coal bunkers to the stokers in our boiler room were first installed, they were made, as they are in similar cases, of sheet metal, which soon wore through, and they were a continual source of annoyance and expense to that department. In the regular course of events our Maintenance Department came around to the idea that possibly, with the aid of the Welding Department, some sort of a coal chute might be built out of 10" steel pipe which would wear much longer and would be more economical and free from trouble.

Our drafting Department designed a coal chute similar in shape to the one which they had been using, but with the leads made out of 10" pipe. To make these chutes required the shaping of a hopper made out of boiler plate, and the welding of two joints to make this hopper tight. The hopper was then welded to the 10" steel pipe which makes the chute, and two distributing pipes were cut into the chute at an angle of 30°, five feet from the end of the chute, so as to distribute the coal from three outlets into the stokers. Since the first one of these, which was made over five years ago, was installed, we have made a great many from time to time, as the old sheet iron chutes wore out. But not one of those we made and installed has ever been replaced, and only a few have had to be repaired. A small hole wore through in the underside of one of the hoppers. An 8x10" piece was cut out of this hopper, around the hole, with a cutting torch, and a patch welded in. This patch is still on the job, and from all indications will continue to be on the job indefinitely.

There is one feature of the Western Electric Company's operations which is but little known by the public in general, and that is the number of varied activities which are carried on inside of our organization other than purely manufacturing. Among these are athletic contests of all kinds. Baseball has its regular place, as it should in every truly American organization. Our baseball team is one of the strongest teams in the city, and on the west side of our big plant we have a Memorial Field, which was dedicated to the boys of our organization who gave their lives to the cause of Freedom in the great World War. After this field had been set aside they decided they needed a backstop for the baseball team, and we were called upon to build it. Our Engineering Department had drawn up a very pretentious plan for a backstop. This backstop is 24' high, with a center section, directly in back of the catcher, 18' wide, and two wings extending towards the field at an angle, each 16' long.

To make a structure of this size out of shapes of various kinds would represent considerable work and expense for material. The specification read—"Make of 3½", 2½", and 1⅝" outside diameter pipe." This pipe was good extra heavy galvanized pipe, and we were asked if it would be possible for us to weld this pipe together in trusses designed by our Engineering Department strong enough to carry the big frame which they believed necessary to support this backstop. We told them we thought we could, and went to work. Altogether there were over 100 joints in this big backstop frame, every one of which we welded. Most all of the pipes were cut to size and fitted with a cutting torch. Something of the size and strength of this backstop can be appreciated when I tell you that the two center trusses, which support the central section of this backstop, weigh about 150 pounds each. This work was first welded together in sections lying flat on the ground and then hoisted into position with a gin hole and chain tackle, and then welded into place.

After everything had been put together the foreman on the job expressed his doubt as to whether the skeleton frame would stand when the support of the chain tackle was removed, but I had every confidence in the work as it had been done, and am pleased to say that after the chain hoist had been released the whole structure settled only about ¼ of an inch; and, although it has been standing for over five years, it is today apparently as solid as ever.

And now, just a few words in conclusion. I was asked not so long ago what could be done to extend gas welding in our works and why we were not doing even more than we were. As might be expected, we use both the electric and gas processes, trying always to use the process which will give the best results with the lowest cost. This of course sets up a condition which makes the two processes competitive to some extent, and I believe the conflicting claims of the different representatives of the gas process has done more to retard its progress in our plant than anything else. The cost, too, is an important item, because in an organization like ours costs are scrutinized very carefully. And I believe you gentlemen will best serve your interests, not only in our plant but everywhere, by furnishing the needs of your industry at prices that are as low as practicable, consistent with first quality, and by furnishing suggestions and information regarding its use that will bear investigation.

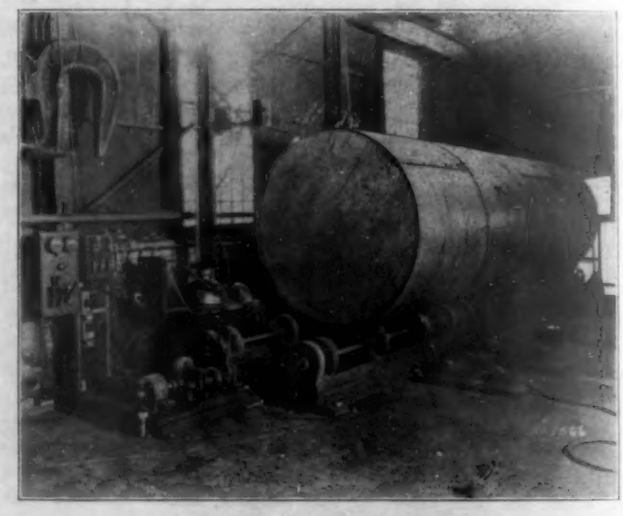
Your business can grow in our plant, and elsewhere, too, if you will only realize that

"It ain't the guns nor armament,
Nor funds that they can pay,
But the close cooperation,
That makes them win the day.

"It ain't the individual
Nor the army as a whole,
But the everlasting teamwork
Of every blooming soul."

AUTOMATIC TANK WELDER

Lincoln Electric Company of Cleveland, Ohio, has brought out an automatic electric arc welder for seams and girths of underground storage tanks. With this equipment, the entire tank is assembled and tack welded together. Longitudinal seam welds are made by an automatic moving head attached to a single copper guide.



View of Automatic Tank Welder

After the seam welds are made, the tank is laid upon the wheels of special Lincoln equipment and is then revolved under an automatic carbon head, making girth welds.

The builders state that with this automatic tank welding machine the average welding speed is between 50 feet and 60 feet per hour. Most of this type of work is being done on 3/16 inch material. In place of four hours being required, as formerly, to do the welding on a large tank, it is said that the entire job is being handled in one hour and twenty-five minutes.

HOWLAND NOW WITH CENTRAL STEEL

O. L. Howland, who for several years has been connected with the Indianapolis office of the Lincoln Electric Company, recently resigned his position to accept a new appointment with the Central Steel & Wire Company, of Chicago. Mr. Howland was connected with the Central Steel and Wire organization for several years, in the Chicago district, previous to his connection with the Lincoln Company and has a number of friends in the welding industry, in the Middle West.

Welding in Gaseous Atmospheres

Two Laboratories Develop Methods of Improving Arc Welds by Bathing the Arc in Hydrogen or Other Gases

BY surrounding the ordinary welding electrodes with an atmosphere of hydrogen or certain other gases, it has been found by Peter Alexander of the Thomson Research Laboratory of the General Electric Company at Lynn, Mass., that it is possible to produce ductile welds. The gas acts as a flux and shield against the oxygen and nitrogen of the air; therefore the formation of oxides and nitrides of iron in the molten metal is prevented. The process originated from the study of metallurgy of the arc-deposited metal and the causes that limit its ductility.

The method is based on the action of molecular hydrogen. This gas at high temperatures, even in the molecular state, is a

Torch for Welding in Hydrogen With Metallic Electrode

very active reducing agent. When it surrounds the crater of the arc it acts in the same way as it does in the hydrogen brazing process. Yet certain peculiarities of the process (for example, the extremely high voltage drop at cathode and anode of the arc burning in hydrogen) are due to the dissociation of the small amounts of molecular hydrogen in actual contact with the craters. Hence the apparent resistance of the arc, and consequently the amount of energy liberated, is about double that when the arc is burning in air.

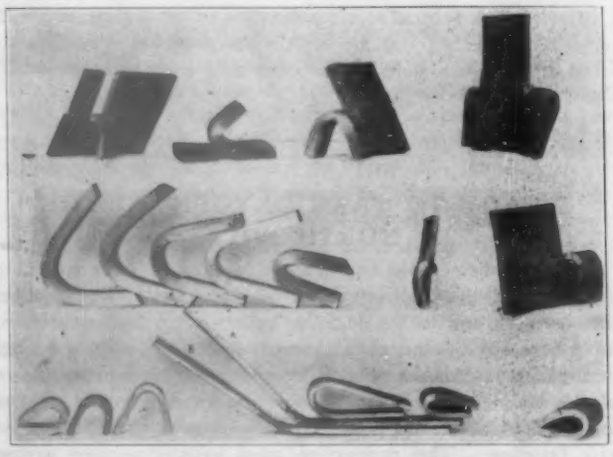
Atomic Hydrogen Arc Welding Torch, Type H

Consequently the weld is not only ductile, but the operation is much faster. The speed results both from the greater energy of the arc in the hydrogen atmosphere and the fact that beveling of the edges of the material is unnecessary. Using 180 amperes and an arc voltage of 60, one-quarter inch boiler plates, butted together without beveling, have been welded at a speed of 60 feet per hour.

Ductility is a factor of prime importance in the welds of structures that are subjected to vibration, accidental bending stress, or overload. Also, ductility equalizes internal cooling stresses when present in the weld. If any part of the ductile weld is stressed beyond its elastic limit, it will not crack. It will yield until the stresses are more or less equalized all along the joint, which is so proportioned as to stand with safety the imposed load. It has also been found that the metal deposited in the hydrogen atmosphere has a higher elastic limit. The elastic limit of pure iron electrodes before deposition averages 39,000 pounds per square inch; the elastic limit of the same electrode deposited by the arc in hydrogen averages 42,000 pounds per square inch.

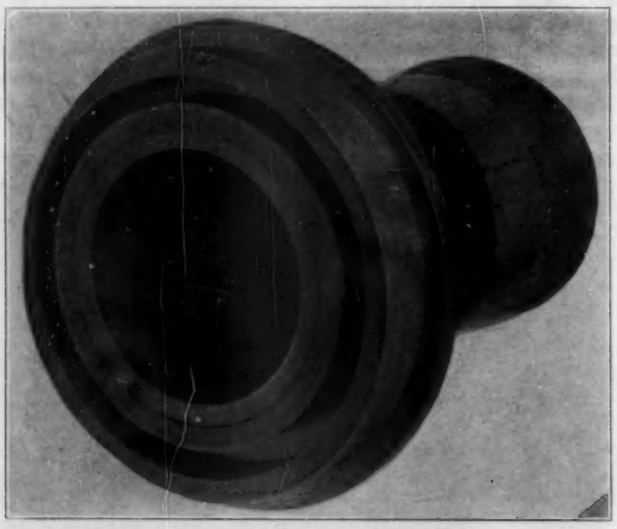
In this welding process the arc is maintained inside of a hydrogen stream which burns along its outer surface of contact with air. The electrode is entirely surrounded by hydrogen, which eliminates the possibility of the metal in the crater coming in contact with air. Direct current is used. The equipment as developed in the laboratory includes the direct-current generator, gas hose, and spool of welding wire mounted as a unit on one base. The welding wire, the hydrogen gas and the electric current are sent through a flexible hose to the torch nozzle.

90 Degree Bend in Atomic Hydrogen Arc Weld



Transversal Bends on Samples of Arc Welds Produced With Semi-Automatic Machine in Hydrogen Atmosphere

After the work with the hydrogen atmosphere was found to be successful, experiments with mixtures of hydrogen and carbon monoxide were conducted in accordance with Professor Elihu Thomson's suggestion, and under his personal guidance. Water gas, containing about equal volumes of hydrogen and carbon monoxide, was next tried. It was found that welds produced in such an atmosphere were ductile and easier to produce. Work with various mixtures of carbon monoxide and hydrogen, produced either synthetically or by decomposition of various organic compounds, demonstrated that ductile welds can be produced in the atmosphere of any mixture of the two gases. Methanol or synthetic wood alcohol was found to serve well in this gas, so that transportation with portable outfits is facilitated.



Weld of Rectifier Seal, Joining Chromium and Low Carbon Steel

A series of experiments with nitrogen-hydrogen mixtures showed that mixtures of these gases also give ductile welds. The use of liquid anhydrous ammonia which contains one volume of nitrogen and three of hydrogen, in this connection makes it possible to store large quantities of the gas in small volume as a liquid.

Still other gases and methods are being investigated in the Lynn laboratory, and academic studies are being made of the theoretical aspect of welding in different gases.

In its present state the process is being extended to the welding of alloy steels, non-ferrous materials and their alloys. The careful selection of the appropriate gaseous mixture determined by the nature of the materials to be welded is an essential factor for successful work.

In brief, this process is a combination of an electric arc which supplies the energy and an appropriate chemical reagent which being in a gaseous state and at extremely high temperature acts almost instantaneously.

READY TO TAKE OXYGEN TO THE NORTH POLE

We have been able to secure a photograph showing how oxygen would be delivered on the top of the world, where the temperature is 60 degrees below zero. Apparently, we have here an Eskimo chieftain of the arctic operating an oxygen plant in Alaska, the land of scenic enchantment, and photographed while mushing over the snow from Ft. Darrow to Nome, Alaska, and points up the Ukon River to Ft. Ukon and Dawson. The properties used in the picture are all genuine, for the driver wears the Parka and Mukluks of white reindeer, this highly decorative outfit being worn only by Eskimos chieftains. The skin is secured by the brain of the animal and sewed with the sinews. The long fur on the hood keeps the face from freezing and the hood is lined with more fur to help keep the frost out. The driver's snow shoes were also made by Alaskan Indians. The lead dog, whose name is Klondike, is related to the wolf, the malemute and the MacKenzie huskie. The dog harness is the regulation article with a collar like the plow horse, so that the sturdy animal can pull the load with his big shoulders.

The disguise is so perfect that only close friends would recognize the driver as John Brant, the proprietor of the Indiana Oxygen Company, of Indianapolis, a very well known

An Eskimo Chief in the Oxygen Business

member of the oxygen producing industry. Mr. Brant brought this complete outfit back from Alaska, after a vacation trip which he made up there last fall and the picture indicates that he is able to get considerable fun out of his souvenir. Being a good booster, he loaded the sled with articles which he thinks everybody in the industry should know about:

Gold Seal Acetylene, made by himself and compressed into cylinders made by the Keith Dunham Company.

Indiana Oxygen, made in his plant and compressed into Wharton cylinders.

Shawinigan Carbide, for which his Company has an agency.

The insert, however, shows the sled with a load on it which Mr. Brant considers a far more valuable one, this is little Jack junior, who gets a heap of fun playing with his daddies arctic automobile.

A NEW BOOK ON CUTTING

A new book entitled "Cutting Steel With The Torch" has just been published in Paris, by R. Granjon and P. Rosenberg. This is described as a practical manual on cutting with oxygen and contains 80 pages with 89 illustrations. After a short historical treatment the Authors study the processes of cutting, the preheating flame, the material cutting torches themselves, and the cost of cutting. The installation of cutting outfits, regulations of the flame, the operation and procedure are then reviewed in order. Finally the matter of starting the cuts and a few exercises in cutting are presented. In the concluding pages the book covers the subjects of machine cutting, cutting under water, rivet cutting, the cutting of cast iron and the different uses of the oxygen jet. The book is, of course, printed in French and the price quoted is 3 francs per copy. The address of the publishers is 104 Boulevard de Clichy, Paris, France.

Tony Learns About Cast Iron

When Preheating Is Necessary There Is Little Chance to Sidestep the Job, and Short Cuts Lead to Failures

By S. W. Henderson

AS I APPROACHED Tony's shop one day he appeared in the doorway. Yanking a bandana from a coverall pocket he mopped a very red and sweating face. "Hot today, Tony?," "Oh! hello Henderson, Yeh, it's hot, and hotter inside. Come in and get warm?"

Taking me by the arm he led me into the shop. It was indeed, plenty hot. The cracks that let in so much cold air, were in evidence but not working. No wonder though, for a loose brick furnace, charged evidentally with wood and charcoal, was sending forth blue smoke and heat.

Tony explained: "Day before yesterday a guy brought in a boiler. He said it was a hot water heater and he wanted to know if I could weld up a little crack on one side near a corner, here." Tony lifted off an old piece of sheet iron which covered the furnace. A rectangular cast iron casting lay in the smoking embers. The corners were rounded and near one of the corners was the evidence of an attempt at welding. Cast iron splattered and splashed, heaped up and honey-combed with blow holes, puddles in spots showing adhesion, wandered over the rounded corner and down out of sight, on the side.

"The darn thing kept cracking on me when I was welding it. When he brought it in, it had a crack about four inches long. He looked like he had money, so I tells him, 'Sure I can fix it but I will have to preheat it and it will take quite a while to cool, give me four, five days and I can guarantee a good job.' It was all right with him.

"So yesterday morning I started on it. You see it was a nice easy crack right on the corner and I figured that I could weld it in a few minutes, for it was all bull that I was giving him about preheating it. I figured to warm it up a bit with the torch and have it done in a half an hour. You see if you tell 'em that you can get at it right away and have it that after-noon, when you put a good price on the job, they think the job aint worth it. I told him this would cost him about $4.50, figuring to make about $3.50 for my trouble.

"So I takes my biggest tip and screws down the regulators and lights up. I warm up all around the crack and starts to weld. The rod didn't seem to want to stick to the iron, kept running off like bronze when you are working on the side of a casting. I dips in and threw on a small hand full of flux, That helped some, so I built her up high figuring that would hold her. I welded about half an hour and still I could see a crack. Needing a smoke I pops off the torch and takes a look at her, and I have a weld ten inches long.

"I goes over and gets a drink an rolls one. Standing there I tries to dope it out. I hears a funny little 'Ping' I thinks, 'that sounds like some thing busted, hope it aint my weld.' Walking over I bends down to see and right to my face she goes, 'Ping' and I saw a little crack on one side of the weld.

"I lights up the torch and welds up all the cracks I see and turns over the boiler, takes a look at the end of the crack and starts to weld there, planning to weld back to the other weld. I makes it though I thinks like I heard a clicking sound but the tip was making so much noise I aint sure.

"I closes the torch, takes a piece of sheet iron, bends it so as to lay over the boiler and goes to see what a guy wants that is standing in the door, we are talking about a hot water coil he wants fixed and I heard that clicking ping again. Not wanting him to think I don't do good work, I waits till he is gone to take a look at it.

"See! its cracked here and here and there is a whole lot of other cracks that you got to get close to see. I closes up the shop and goes to see a friend of mine that's a welder, I tells him that I got hold of a rotten piece of cast iron, he asks me what's its shape. When I tells him, he says I told the guy the truth when I said that it had to be preheated, says for me to get a bunch of bricks and a couple of sacks of charcoal, set the casting on the floor, build the bricks around it, chuck in charcoal between the casting and the bricks and let the casting get red hot all over. He says I better chip out the weld. I think he is full of prunes, for why should I waste all that good iron. My tip is big enough to melt it in the cracks again."

"Yes and no Tony, "I replied," it isn't that you cannot use the iron again but that it is so mixed with a slag and other impurities that to chance using it again is liable to make you lose your weld again. From the looks of things you did not V out the crack; did you clean off the oxide from the sides of the cracks?" "As I said a minute ago" was the reply. "The tip is big enough to burn through, so why waste time making the crack bigger? And what's the use of cleaning off the oxide, cast iron has to get hot enough to flow before you can weld; it ain't like soldering."

"Veeing out is for the purpose of giving you a clean surface free from oxide and a space that will allow you to add a lot of new metal; to help you to get a good stick all the way through the crack. It is the cohesion or the mixing of the filler rod with that of the casting that means the strength of the weld. Cast iron melts at about 2,000 to 2,190 deg. F. while this oxide you are speaking of melts at 2,450 deg. F. While oxide will form when cast iron is heated to a red heat, it is heavier than the molten cast iron and sinks in the molten mass. Flux will help dissolve the oxide and also has the power of floating the oxide to the top, and when the weld is cooled the mixture of flux and oxide is easily removed from it."

"Yeh! mabbe you are right, seems like I remember my friend saying some thing like that, but I never had no trouble like this before so I thinks he is just talking to show me he knows some thing about welding."

"In our shop" I continued, "My Boss would not care to take a casting of this sort. It is known as a cored casting and cored castings seldom have walls that are uniform in thickness. We find that because of the low strength of cast iron, when hot, and its brittleness at all times, cast iron must be heated before the welding and reheated after welding to allow for the expanding and the contracting of the heated or cooling casting. If this is not done the sudden heat of the torch will cause the casting to crack.

"This crack on the casting is called a blind crack, because it ends in the metal, far from an edge of the casting. Heating at one end of the crack will cause expansion which will open up the crack. To put it in another form, if you wished to split a block of wood, you would start a wedge and hammer on the wedge. In your case you wedged open the crack with the flame, and as you continued with your weld expansion (your wedge) kept opening the crack in front of the weld, for the brittle metal could not give enough to allow for the expansion that you were forcing it to make.

"No doubt if you were to follow the imaginary path that this crack would take to an edge or port hole in the casting and you heated with a preheating flame this section of the casting, you would have a great deal better chance to make the weld hold, for you are allowing for the expansion heat at the point of welding, on the part of the casting that your crack would follow, if the casting were not heated.

"Now there are spots in your weld that show that you did not

get cohesion. No doubt you noticed when heating them that when they were brought to a welding heat little incandescent spots showed, your filler rod would not make a stick, and the melted iron would roll off. Cast iron has a great affinity for oxygen when heated, and a casting that has been heated for long periods, undergoes a chemical change and the flux that will be satisfactory for ordinary cast iron will not have the power to clean the surface that is being welded; to allow fusion of the rod and casting.

"A cleanser liberating chlorine will make fusion possible, sodium chloride (salt) or chloride of lime are easily purchased. Badly burnt iron (stove grates) is easily welded with chloride of lime, but the chlorine fumes are very irritating to the membrane of the nose and throat and a welder should never stand over the weld in such a position that he is forced to breath the fumes.

"In your case salt should be sufficient, used straight or mixed with a little borax. Get your crack to a welding heat, have the filler rod coated with the flux, rub the rod against the heated iron and some of the iron from the rod will adhere to the work. Keep the rod covered with flux and keep working the rod till you have coated the old iron with the iron from the rod, then you weld just as you do with ordinary iron for you have a surface that the iron from the rod joins easily.

"But in any case it would be best to let the casting cool and chip out all your old weld as you have in places, build up so high that it will be impossible for you even with your biggest tip, to force through it to the bottom of your old weld. You haven't cohesion and no matter how much flux you add you will not be able to get good cohesion in the bottom of the old weld for you did not get fusion before. The way the casting is cracked shows that one edge of your weld pulled away, chipping it out. You will find at those spots you didn't get cohesion but simply made a plaster weld, on top of the old iron but not fused into it."

"Yeh! I guess I can fix it, you and my friend are the greatest pair of crape hangers I ever saw. I gets in a jam, you tells me I got no business taking that kind of a job, I try to fix it and you give me a hundred and one reasons why I ain't right. You birds got it easy, you work in big shops and you got men that know about what to take and how to fix them, while me in this shop I got to take what ever comes in for I got a wife to support.

"Now I never did work on none of them cored castings but if I don't take any of them in how am I going to learn to do this kind of work. This guy sez he will stand for up to $25.00, so why shouldn't I fix it for him. Maybe I won't make much off him but I figure that when the next job like this comes in I will know some thing about it and how much to charge for the Job."

"Heres wishing you luck with the casting Tony, clean out the cracks, heat it good and red hot, cover it well and let it take plenty of time to cool and you stand a good chance in making it hold." I beat it then.

Next day something came up that prevented my dropping in to learn the outcome of the job, one day after I went back to work an auto mechanic that worked in a shop, across the street from Tony dropped in on me, I asked him if he knew how Tony made out. "I'll say so, that night I was working late and I saw a light in Tony's shop till about ten. Next day wondering what had kept him at work so late I went over, Tony was standing near a chunk of iron, the usual smiling face was frowning and from a echo I heard I think he was talking to himself."

"How are things going?" said I. "Hello Brant! Rotten! this bum casting has just about got my goat, the irons no good, first I welds it and it cracks then that guy Henderson drops in and tells me that I don't know how to weld it and gives me a lot of bull about what he would do and floats off just when I was figuring on telling him if he was so sure he could fix it, to stick around and do the job.

"He tells me the iron is burnt and give dope on how to weld it, I gets some of the salt and tries it; he tells me not to breathe any of the fumes, I had the casting red hot and when I tries to weld I gets them fumes in my nose and I tries to get out of the way and then I can't weld good 'cause I am standing out of the way so I use my regular flux and finish it up.

I gets through pretty late, covering it up I beats it for home when I looks at it this morning, its got cracks running every which way. I calls up the guy that brought it in and tells him its too burnt out to weld, told him that I worked all day yesterday trying to fix it, but it is burnt so bad that when ever I put the heat on it, it cracks, he says seeing it cracked in the first place what I say sounds reasonable and to send him the bill for what I paid out and he will send me a check, so I learns something and ain't out anything, but I won't be able to charge him for my time, and you know a guy never gets anywhere if he can't get paid for his time."

About a year afterward I was working in a shop; welding, on the same block as Tony. I think he was both pleased and sorry to see me for it enabled him when he was stuck, to bring over the article and have me stick it together, and sorry for some of his easy jobs came to my shop.

One day a youngster drops in carrying a Ford cylinder head, said he, "how much will you charge to weld an ear on this head and how long will it take you?" It was an easy break, broken through the threaded hole in the ear. "You will have to rethread the hole too," "I will charge you one dollar and a half to weld the ear, reface it and chase the threads in the hole and you can have it in an hour."

"Gee! you know that fellow down the block? He said that I could not have it till this evening as he would have to heat the head red hot and he had no way of drilling a new hole so I would have to have it done myself and he said that the job was worth two dollars."

Tony evidently had learned his lesson too well. An ear is at the extreme end of the cylinder head and if one will but warm the head up to boiling water heat and keep the direct head away while working there is no danger of causing any cracks. One does not have to fill up the hole in the ear, if the threads are still good, for by taking a stick of molded graphite and threading it, one may screw it in the halves of the hole and produce a hole in the ear so a tap will easily chase threads as good as though the hole were filled, drilled and rethreaded. Ordinary carbon rod will not do as the flame of the torch will cause it to become bright red and in this state it will oxidize sufficiently so the form of the threads will be lost, but graphite will stand bright red heat without oxidizing. In aluminum building it sure does fine work too.

NEW MODEL OF "TORIT" TORCH

St. Paul Welding & Manufacturing Company of St. Paul, Minn., are featuring the new model 23 of their Torit Torch, which is the result of several improvements which have been made on this apparatus. The outfit consists of a small torch with 4 tips for different kinds of work, and a soldering copper, five feet of rubber tubing and a connection for the Prest-O-Lite automobile tank. It is intended for all kinds of small jobs requiring heat, particularly soldering, radiator work, heating, tempering, etc., It is suitable for lead burning where speed is not necessary, but is not intended for welding. No compressed air or oxygen is used, the necessary air for producing the hot flame being sucked in through the tips.

BOILER MAKER'S SUPPLY MEN PREPARE FOR CONVENTION

The Master Boiler Makers' Convention will be held at the Hotel Statler, Buffalo, New York, on May 25th to 28th. The meetings are to be held in the Chinese Dining Room on the Mezzanine floor. Part of the exhibit space will be on this floor and part of it on the main floor. This exhibit and convention is always of great interest to the manufacturers and dealers in machinery, tools and supplies of interest to boiler shops. The subject to oxy-acetylene welding and electric are welding is receiving very active consideration from this Association, committees being at work on the preparation of codes of standard practice. It is expected that during the forthcoming meeting considerable progress in this direction will be noted.

Left—Arrow Indicates Weld Made on Crossing. Center—Showing a Crossing in Need of Welding. Right—After Welding. Welds Indicated by Black Lines.

Welding Manganese Steel Crossings

Designing a Joint to Stand up Under Main Line Traffic When Base Metal Had Very Poor Welding Qualities

By C. M. Rusk*

THE writer was requested by one of the large eastern railroads to inspect a section of their crossing where it intersected another large road and advise them if it was possible to weld the badly worn and battered point. The crossing was manganese steel.

It was found that a piece of the rail of about 120 cubic inches was completely broken out and on closer inspection of the base metal the rail did not look good for welding.

My suggestion was to get a new section to replace this broken point. I was told that it would take some months to get a new section and while they could put in a straight rail which would take care of their main line traffic, it would tie up the trains on the main line track of the intersecting road until they received the new section and they did not want this to happen.

It was then my job to design a joint that would stand up in main line traffic even though the base metal had very poor welding qualities.

We had the section moved to a convenient location so it would be accessible to the welding plant. I called in one of our local commercial arc welders who had a gasoline engine driven (direct connected) generator arc welding set mounted on a truck which was equipped with an air compressor for power to drive grinding tools.

I had all the loose pieces broken out of the cavity and ground all the cracks to form a "V". Then two holes were burned large enough to take 1-inch diameter bolts.

*R. D. Thomas & Co., Phiadelphia.

The accompanying sketch, No. 1, shows the crossing complete with the two main tracks of the company who was going to make repair and one main track and two siding tracks of the intersecting road. The section marked N of the company's main track is the point where the weld was made.

Sketch No. 2 shows the section enlarged and the fine line shaded area represents the weld metal.

Left—Before. Right—After Welding Crossing

Sketch No. 3 shows the front view of section A-A, B-B, C-C. The heavy shaded area represents the only portion of metal that would give good welding results, the other area represents poor base metal for welding. There is also shown the two 1-inch diameter bolts protruding through. These bolts were welded to the top and bottom of rail, making them a part of it. The end view of section B-B sketch No. 2 is shown in cross section. This shows the round flat head of the bolt welded to the rail.

Again the fine line shaded area represents welded metal.

Sketch No. 4 shows the rear view of section A-A, B-B, C-C. Notice the cracks are welded out to the toe of the flange.

The welding job required two men working thirty-three hours to complete or sixty-six man hours.

They used 45 pounds of $\frac{5}{32}$-inch diameter coated manganese electrodes.

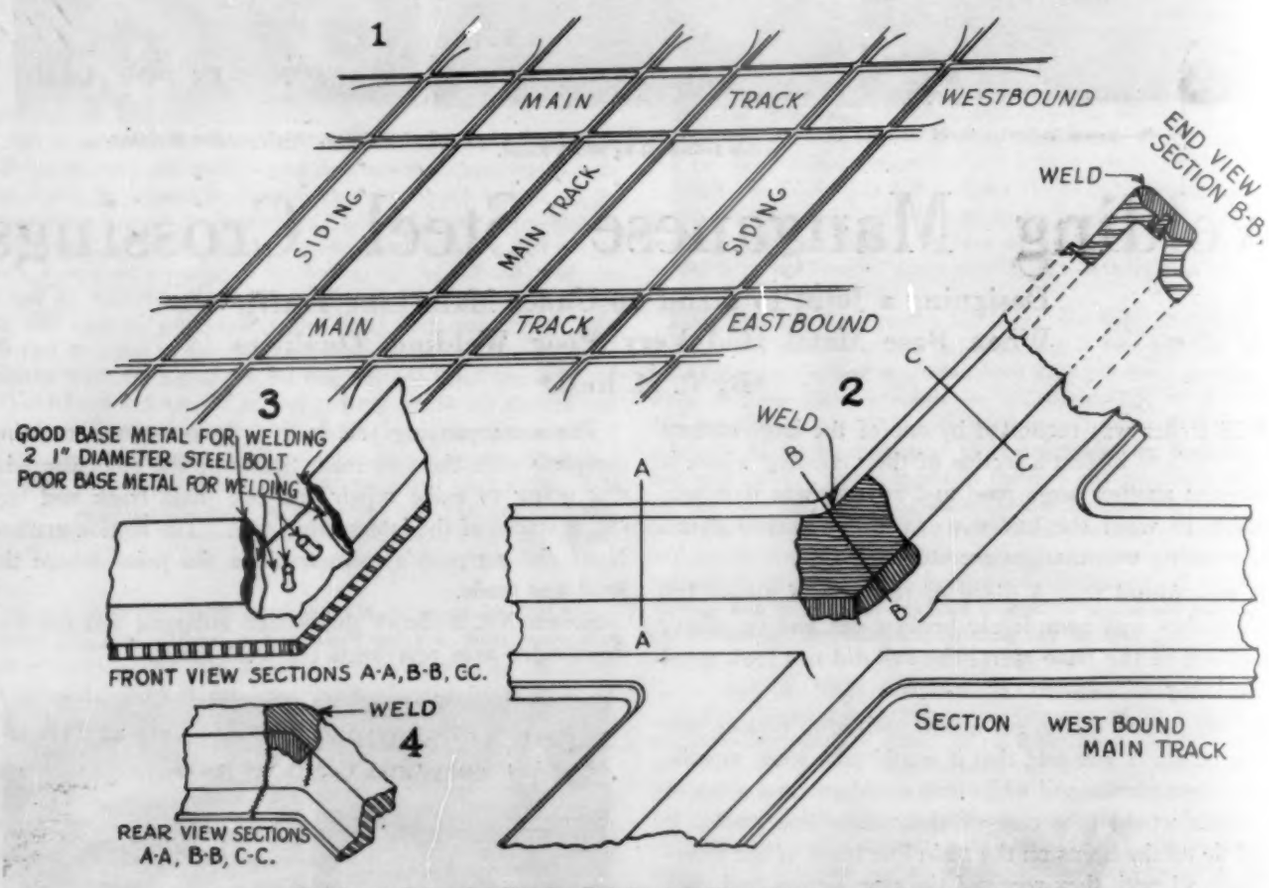
The actual welding time was 25 hours.

The time required for grinding, etc., was 8 hours.

The rail was placed in service on January 15, 1925, and taken out September 15, 1925, at which time they replaced the entire crossing and adjoining track with new rail.

The welded point in this section, as you will see, is the receiving side of the rail and receives all the pounding. There is a total of 60 trains per day passing over this intersection. Let us assume that this is 30 passenger trains of 6 coaches each and 30 freight trains of 30 cars each, and we have a total of 1080 cars per day. This, however, does not include the trains of the intersecting road.

The photographs at the head of the article show three views just before the crossover was removed. Photographs No. 5 and 6 show close up views after the section had been taken out of track.



Sketches 1, 2, 3 and 4 Showing Details of Welding Manganese Steel Crossings

MR. MESSER VISITS AMERICAN CUSTOMERS

Mr. Adolph Messer, proprietor of the Messer Company, Frankfort, Germany, has just returned to that country after a visit of several weeks in the United States. A number of oxygen manufacturers in this country have installations of the Messer air liquefaction oxygen producing plants and he had an opportunity to visit several of them during his stay in America. Before leaving for Germany Mr. Messer indicated that the trade conditions over there seemed to be improving in his line, after a short set-back which the industry received, due to the completion of the work of cutting up battle ships, this being a project which had created a tremendous temporary demand for apparatus and gasses. Mr. Messer evidently anticipates a continued program of good business because the plant facilities of his company in Frankfort have recently been increased to a considerable extent by new construction.

A. W. S. ACTIVITIES IN CHICAGO

At the March meeting of the American Welding Society, Chicago Section, a motion picture entitled "From Mine to Consumer," was presented by the American Brass Co. This picture showed the complete detail of the manufacture of copper and brass, from the original mines to the finished products in the shape of sheets, rods and tubes. Following the showing of these films there was considerable discussion of the different phases of bronze welding. It is expected that further discussions of this ubject will be in order at the regular April meeting of the Section.

THE INSTITUTE OF METALS HOLDS GENERAL MEETING IN MARCH

The annual general meeting of The Institute of Metals was held in the Hall of the Institution of Mechanical Engineers, London, March 10th and 11th. Fifteen technical papers were presented to the meeting, which was followed by a dinner at the Trocadero Restaurant.

POLAR EXPLORATION BY AIRPLANE

All-Metal Craft to Be Used by Wilkins Requires Small Machine Shop at Top of the World

A new attempt is soon to be made to unlock the secrets encased in the ice-bound fastness of the North Polar regions. The expedition is under the command of Capt. George Hubert Wilkins, Australian explorer and aviator, and one of the chief scientific aids to Sir Ernest Schackleton on his South Polar exploration.

His party will hop off in March from Point Barrow, Alaska, in two large Fokker monoplanes, to carry the United States flag across the top of the world to Spitsbergen. His Prime objective is the Ice Pole, characterized by Steffansson as the "Pole of Relative Inaccessibility," lying in the center of the great northern

Loading the Welded Fokker Monoplane for its Trip to Seattle, from Where it Will be Carried by Boat to Alaska

ice field. The airplane is considered the only means of reaching it. Should an undiscovered Polar Continent, which has been so eagerly sought, be found, the land will be claimed for the United States.

The expedition, known as the Detroit Arctic Expedition, is being conducted under the joint auspices of the Detroit Aviation Society, the American Geographical Society, and the North Amer-

Ready for Arctic Exploration Taking Oxy-Acetylene Equipment Along for Repair Work

ican newspaper Alliance. The two Fokker monoplanes, one large and one small, have already been conditioned and shipped to Seattle by the Atlantic Aircraft Corp., of Hasbrouck Heights, N. J. From Seattle the planes will be carried by boat to Alaska and assembled.

Point Barrow, the most northerly point of land in Alaska is the expedition base. All supplies will be centered there. The smaller plane will be used for reconnoitering, and should land be found where a new base can be located, it will be used for moving supplies up from the Point Barrow base.

Every care has been taken to safeguard the explorers. The two Fokker monoplanes, the larger equipped with three Wright motors of 200 horse power each, and the smaller equipped with one 400 hp. Liberty motor, are built entirely of metal. The fuselage and other framework are of the finest steel tubing. Like in all aircraft built for the U. S. Army, every joint has been oxy-acetylene welded to insure the greatest strength and reliability without increase of weight. Complete welding equipment will be carried to Point Barrow, so that any damaged metal part can be immediately repaired. This is the first time in history that oxy-acetylene apparatus has been taken as regular equipment on an exploring expedition, but since this attempt at the polar fastnesses is largely a matter of machines, it is important that the most versatile yet most compact equipment for repair be carried along.

NEW A. W. S. SECTION IN PORTLAND

Preliminary steps for organization of a section of the American Welding Society were taken in Portland, Oregon, February 18th, at a meeting attended by the following: John Beall, president, Beall Pipe & Tank Corporation; Fred King, president, King Brothers Auto Works; W. H. Creighton, Creighton Boiler & Welding Works; John Ullman, Clark-Ullman Boiler Welding Co.; E. F. Platt, president, The Portland Oxygen & Hydrogen Company; W. F. Beard, Welding Supervisor, S. P. & S. Co., Vancouver, Wash.; Samuel Powell, United Metal Trades Association; Mr. Roberts, Northwest Welding Company; C. E. Rose, representative, Air Reduction Sales Company; Messrs. Christensen & Shuck, C. & S. Welding Works; C. T. Price, sales manager, Portland Welders Supply Company; Mr. Dierking, superintendent, Steel Tank & Pipe Company; L. C. Thomas, L. C. Thomas Company; J. D. Platt, II, treasurer, The Portland Oxygen & Hydrogen Company.

Mr. John Beall was elected temporary chairman and M. Samuel Powell, temporary secretary.

The meeting to which all eligible to membership will be invited to attend, will be held March 11th.

CHEMICAL EQUIPMENT MANUFACTURERS MEETING IN MAY

The May meeting of the Association of Chemical Equipment Manufacturers will be held in Cleveland, May 10th to 15th, in the Public Hall. Admission to the exposition will be by registration, which will require identification as to technical status and industrial or technical affiliation. Plans are being made to provide a good program and good exhibits for 3,000 engineers who are expected to be present. There will be a unique oxy-acetylene cutting and welding exhibit prepared to show the application of the process to industrial uses. There will also be exhibits of welded products.

CORRECTION

In the February issue of *The Welding Engineer* our proof reader allowed several errors to be made in the description of the products of the Phillips-Laffitte Company, of Philadelphia. In order to clear up the confusion which these mistakes would naturally cause, it may be stated that the products of the above Company include welding plates, welding powder, tempering powder, brazing powder, brazing strips, brazing plates, aluminum solder, cast iron brazing paste, oxy-acetylene welding flux and welding rods.

FEATURING WELDING AT THE LOCAL SHOW

From time to time local expositions and conventions give dealers in welding apparatus and supplies an opportunity to put a good display of their line before a desirable group of prospective customers in their own territory. This photograph, taken of the exhibit of the Universal Oxygen Company at the Automobile Show recently held in Milwaukee,

Universal Oxygen Co. Display at Milwaukee Automobile Show

Wisconsin, shows how Mr. S. H. Smith, Manager of the Universal Oxygen Company, Milwaukee Branch, goes about it to put his products out where people who should be interested in them can see them. There is a thoroughness and neatness about the display which is quite characteristic. Mr. Smith says that he considers this sort of activity very much worth while.

ELKONITE ALLOYS FOR RESISTANCE WELDING

A recent development in the field of resistance welding is featured in the announcements of the Elkon Works, Inc., Weehawken, New Jersey. Their product, "Elkonite," is a series of copper and other metal tungsten alloys based upon original General Electric Co. plants. These alloys are proving valuable for many uses in the industrial world, usually in such fashion as to prove the solution of a difficult electrical problem. Their application in resistance welding, particularly spot welding and seam welding, is brought about by the difficulties experienced in certain classes of work through the annealing effect of the welding operations on the hard drawn copper electrodes now commonly used. The Brinnell hardness of the copper electrode material is 90, dropping to 40 in service. The softened copper spreads and mushrooms, increasing the area of contact, changing the current density, and causing the electrode to stick to the welded pieces, and otherwise altering the quality of the weld. The Elkonite series of alloys has a Brinnell hardness around 225 and its compressive strength is over three times that of hard copper. Furthermore, it does not anneal at red heat. The manufacturers claim, therefore, that it has ideal characteristics for the service which heretofore has been attempted with copper electrodes with unsatisfactory results.

Tungsten being a rare element, and expensive to produce in any of its forms, the initial cost of the Elkonite is comparatively high, so it is not recommended to be used for making an entire electrode. Instead, tips or inserts of the required size and shape are applied to the usual hard drawn copper electrodes. "Its application," says Mr. George N. Sieger, of the Elkon works, "will be found in those spot welding operations which are proving severe on the ordinary hard drawn copper electrode, even when water cooled, and in those fields where the spot and seam welding processes have not been adopted because of the failure of copper electrodes to produce satisfactory results."

Reports on welding operations already being performed by t Elkonite tipped electrodes show remarkable durability. In factory it is said that 750 units were produced with one set electrodes, as compared to one unit per set of the old electrod

Elkonite Resistance Welding Electrodes

In another instance it was reported that where a copper electrode produced a maximum of 300 welds, a set of electrodes tipped with Elkonite produced 27,000 welds. Here it is necessary to consider the time lost in changing electrodes under the old system, as well as the replacement cost, in order to judge the efficiency of the alloy tip.

STANDARD OXYGEN VALVE OUTLET THREADS

After careful investigation of all oxygen threads now in use the Test and Specification Committee of the C. G. M. A. reccommends as a standard thread the thread illustrated in the drawing. It will be noted that the specifications so far adopted include only the form of thread, the thread diameters and the number of threads per inch. The committee is now working on the problem of establishing a suitable standard for the length of thread and

OXY CYL. VALVE OUTLET THD.
MAJOR DIA. - .904" +.000" -.003"
MAX. PITCH DIA. - .8576" MIN. PITCH DIA. - .8546"
14 THDS. PER INCH - U.S.F. - RIGHT HAND

OXY CYL. VALVE CONNECTING NUT
MAJOR DIA. - .906" +.005" -.000"
MAX. PITCH DIA. - .865" MIN. PITCH DIA. - .860"
14 THDS. PER INCH - U.S.F. - RIGHT HAND

the dimensions and shape of union nut, connection nipple, and recess in the valve.

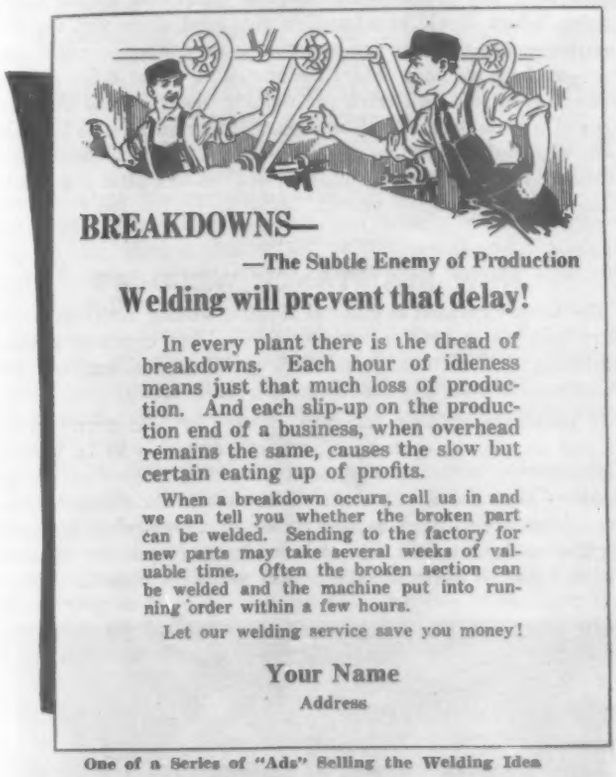
It is requested that all those interested in the use of oxygen threads review the specification so far developed, forwarding to the Secretary any criticisms or comments which it is desired to make. In the absence of comment it will be assumed that the proposed standard thread dimensions are acceptable.

JOINT DESIGNS THE FEATURE OF ANNUAL SPRING MEETING OF A. W. S.

The annual spring meeting of The American Welding Society will be held at 33 West 39th Street, New York City, April 21, 22 and 23. The usual program of committee meetings and reports is announced in the advance notice of the meeting and the program of the technical sessions indicates that the principal discussion will be the design of welded joints. Papers have been prepared by engineers in several different industries, so that the program will cover considerable territory on this important subject and an inspection trip will be made to the plant of the Metal and Thermit Corporation and a dinner dance is scheduled for the second evening.

AN ADVERTISING SERVICE FOR WELDING SHOPS

A folder recently received from Smith's Inventions, Incorporated, Minneapolis, illustrates a variety of advertising suggestions which that Company has prepared for the use of welding shops who wish to advertise their ability to do oxy-acetylene


BREAKDOWNS—
—The Subtle Enemy of Production
Welding will prevent that delay!
In every plant there is the dread of breakdowns. Each hour of idleness means just that much loss of production. And each slip-up on the production end of a business, when overhead remains the same, causes the slow but certain eating up of profits.
When a breakdown occurs, call us in and we can tell you whether the broken part can be welded. Sending to the factory for new parts may take several weeks of valuable time. Often the broken section can be welded and the machine put into running order within a few hours.
Let our welding service save you money!
Your Name
Address

One of a Series of "Ads" Selling the Welding Idea

welding cutting. The illustrations produced herewith show a few of a great many illustrations for which electrotypes are available. These can be used for printing direct mailing literature or newspaper advertisements and the text is supplied for quite a range of newspaper announcements. In addition to supplying the cuts they also supply small folders printed with the welder's name and address, which can be used for local advertising through the

Some of the Humorous Illustrations Used in this Advertising

mails. The electrotypes and printed circulars are supplied at prices depending on the quantity ordered and the text of the advertisement has not been copyrighted, so they may be used by any welding shop who is in need of suggestions for advertising material.

LORN CAMPBELL, JR. TAKES OXYGEN TREATMENT FOR PNEUMONIA

While the mid-winter meeting of the Gas Products Association was getting under way in the Palmer House at Chicago, Lorn Campbell, Jr., President of the United States Welding Company, Minneapolis, and an associate member of the Association, was taken suddenly ill at the close of the first day of the meeting and was unable to leave his room the following day. Toward the middle of the day the physician, who had been called by Mr. Campbell, expressed the opinion his patient was suffering from pneumonia. Mr. Don. B. McLeod, an associate of the Keith Dunham Company, Chicago, through long acquaintance with the oxygen industry was of the opinion that treatment with pure oxygen would be of great assistance in this case. He brought this matter before the attention of the members, who were in session, and arrangements were immediately made by both the Kansas City Oxygen Gas Co. and the Burdett Oxygen Company, Chicago, to deliver several cylinders of oxygen to Mr. Campbell's room. Under the direction of the attending physician the oxygen was released into the room through a regulator, when the patient's breathing became noticeably difficult and its effect was to restore the respiration to normal, when the oxygen supply would be reduced. Mr. Campbell's sickness lasted for about two weeks, during which time the members of the gas welding industry kept in close touch with his progress and tried in every way to be of any help possible. A couple of days after he began to sit up and take regular nourishment, Mr. Campbell returned to Minneapolis for a rest.

The local oxygen manufacturers have been very interested in the success which attended the use of oxygen in Mr. Campbell's case and are encouraged to believe that their product may serve humanity in other ways besides its applications in the metal work industries. There seems to be no doubt that much good was done by enriching the atmosphere of the sick room. It is reported that the attending nurse expressed the belief that the use of oxygen in this case saved the life of the patient. The adoption of such treatment by such a conservative body as the medical profession is bound to proceed along slow and cautious lines but the possibilities are so encouraging that some progress is sure to be made and it is pretty certain that if any one is looking for a hearty testimonial Mr. Campbell will be glad to supply one.

It is interesting to note the difference in the technique of using oxygen in this case, as compared to former practice. The gas was called into use at the start, instead of as a last resort; it was released into the sickroom, instead of being applied directly with a mask; and the commercial size oxygen cylinders were found perfectly satisfactory.

ELECTRIC ARC HELPS BROADCASTING STATION GET RESULTS

WHK of Cleveland Calls Upon Welding to Obtain Better Results

Radio and welding are not commonly thought of in conjunction with one another but apparently the welding industry can help the radio business to obtain better results, the same as it can most any other industry.

Station WHK of Cleveland has its ground through the medium of a large six inch steam pipe. The station is situated on the 11th floor of the Carnegie Hall Building in Cleveland. The steam line in question was put in by the usual thread method and of course contact between pipe and collar cannot be considered as homogeneous. In order to get a connection at each joint which can be considered perfect contact, ordinary street railroad bonds were arc welded from pipe to pipe over the sleeve connection. The work was done with a motor driven set which was moved from floor to floor as work progressed, the operator working from the top of an elevator.

The ammeter reading on the return before bonding was 1½ amps. and after the work was completed a reading of 7 amps. was obtained. The aerial was a riveted structure made with the usual butt strap and angle joint. Everywhere that a joint occurred in this aerial a bead of electric welding was run to tie the two parts riveted together, thus making a homogeneous joint. All-vent pipes were in turn grounded

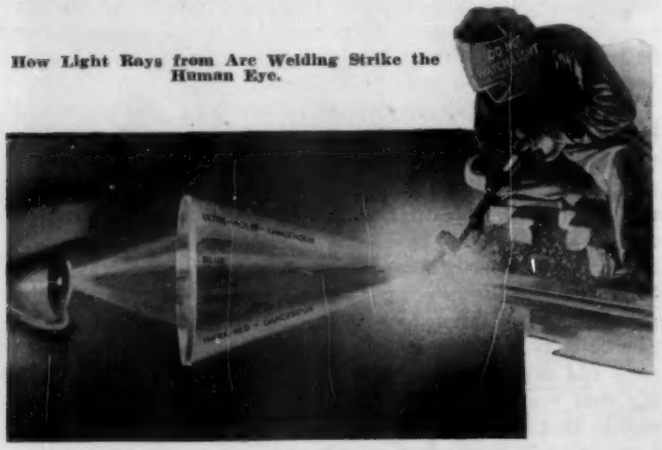
to the tower, terminal connections being made with the electric arc.

Radio fans tuning in on station WHK will all be benefited through the bonding of these pipes. It is safe to say, however, that in a few years bonding of pipes for any purpose will be unnecessary as the all-welded pipe joint which is undoubtedly gaining more favor every day will eliminate the threaded joints, and pipe lines will have a continuity for electrical grounds, which does not exist today.

EYE PROTECTION FOR WELDERS*

Before we can talk about protecting the eyes from the radiations from welding operations, it is necessary to understand what the radiations are and what protection the eye requires. Let us see what occurs in a welding operation. We have a mass of molten metal and the vapor or steam which arises from this metal, both of which have their own characteristic radiations. We can arbitrarily divide these radiations into three parts: the ultra-violet, the visible, and in infra red.

How Light Rays from Arc Welding Strike the Human Eye.



As the easiest to understand are the second, or visible, radiations, let us discuss these first. These visible rays, as the name implies, are the rays we see. If they are too intense, they cause us to squint and shield our eyes. In other words, visible rays produce an immediate sensation in the eye, and because of this fact, they are the least dangerous rays; we know instantly when they are too strong. Their principal source is the white hot part of the metal. Protection against these rays is the simplest, since all we need do is to shield the eyes sufficiently for immediate comfort and good vision. If we were blessed with some means of removing the first and third groups, that is the ultra violet and the infra red, the problem of eye protection in welding operations would be easily solved by simply reducing the intensity to the point where immediate comfort would be obtained. But the first and third groups, the ultra-violet and infra red, produce no sensation of light and all welding operations give out these radiations.

Ultra-violet comes largely from the vapor of the metal as shown by the arc in arc welding. These rays produce practically no sensation of light. Since they have only a relatively small amount of visibility they are what is termed "abiotic" or "tissue-destroying" rays. Their effect is usually felt a few hours after exposure.

The third group, or infra red radiations, are very insidious. They come from molten metal which does not have to be even white hot or hot enough to give off any visible radiations while containing enough infra red rays to produce eye injury. These infra red rays like ultra-violet are invisible and give little warning of danger. The back of the hand or the cheek feels them more quickly than the eye. Their actual harm to the eye may not occur for months or even years.

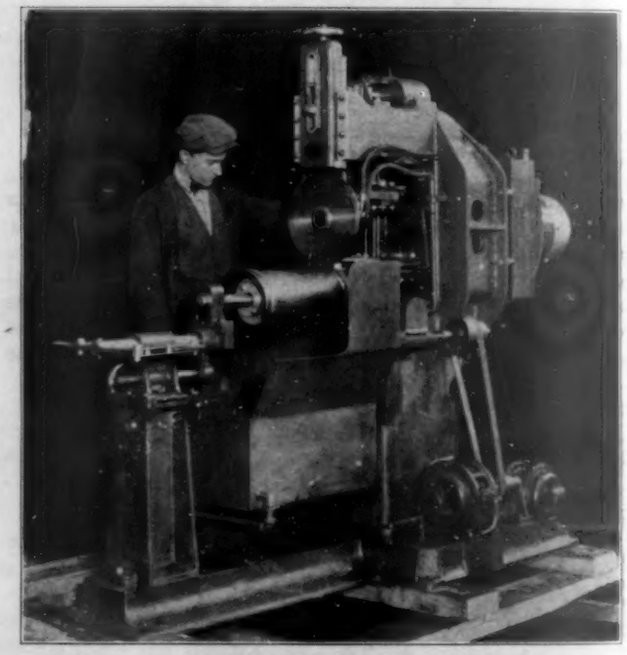
The problem in welding glass design is to cut off the ultra-violet and the infra red, and to let through enough of the visible rays to make comfortable vision for the particular operations involved. For this purpose the American Optical Company has produced a glass under the registered trade name "Noviweld" which eliminates all of the tissue-destroying or ultra-violet radiations (possibly a limit of one millionth of one per cent gets through) and at the same time removes from 96% to 99½% of the infra red group, according to the density of the glass. As to the visible or seeing rays, the amount transmitted is determined by the shade number, which should be selected to give good vision with the full knowledge that the eyes are protected from dangerous radiations. For acetylene welding, shades designated as 5 and 6 are usually recommended and for electric arc welding, shades 10 and 14. The color of a glass does not indicate its protective qualities as is sometimes supposed. Protection depends upon the chemical composition of the glass itself. Before installing goggles in a plant one should make sure they actually protect.

Courtesy of American Optical Co.

NEW RESISTANCE WELDERS

The latest extension in General Electric welding activities is the entry into the resistance welding field. That company is now marketing two automatic resistance welding machines, one for straight seam work and the other for circular seams.

In resistance welding fusion is effected by heat generated by passing an electric current through the materials to be welded, augmented by pressure, whereas arc welding utilizes an arc or flame to melt the work, electrode or both. The General Electric automatic resistance welders consist of a framework for holding the work, a transformer for supplying current to the electrodes, movable electrode wheels and necessary control.



New G-E Resistance Welder

These equipments were particularly designed for welding the seams of light metal containers such as ice cream cans, drums, etc., and are suitable only for making lap joints with relatively thin metal. Among the advantages are the absence of fumes and open arcs making the use of masks unnecessary, and the fact that the operator requires no special welding training.

The welding speed obtained with these equipments varies from approximately 30 inches per minute to 100 inches per minute, depending on the nature and thickness of the material to be welded. Material up to a total thickness of ¼ inches may be accomodated.

A recent installation of this equipment is in the plant of the Solar-Sturgess Company of Chicago, where the circular seams of ice-cream cans will be welded by this process.

VENTILATING A WELDING SHOP

"That's easy," I hear nine out of ten Architects, Builders and Engineers say. All you have to do is put some good big ventilators in the roof and a chain pull skylight to let the smoke go out. Notwithstanding the fact that this arrangement don't work, they have been and will continue to do it this way and collect the money for the work.

After explaining, the reason for this failure will be as simple as A, B, C.

We will assume that you have an auto discharging smoke or charcoal fire preheating, a greasy job. The weather is cold and the doors and windows are closed, and the air required for the auto engine and the charcoal fire will come down through the ventilators, the smoke from the fire rises to the coal, because it contains heat which makes it lighter than air, but when it tries to go out through the ventilators it meets the incoming cold air, is robbed of its buoyant heat and falls to the floor as a heavy gas.

The remedy for this condition in a garage is a live steam coil under the skylight, to heat the incoming air and an electric fan in the wall on the level of the floor to take out the heavy gases. In a welding shop, a welding and preheating booth, is an indispensable necessity.

In this shop the welding booth is 4 feet square and 7 feet high, having a stove pipe at the top to a chimney, the front slides up and down, and is counterweighted. We have our forge in this booth most of the time and also use it as a welding table. For heavy jobs we put a grate on the floor of the welding booth, surround the job with fire brick, light the charcoal fire and slide down the front. When the job is hot enough we raise the door and weld. This is a very succcessful remedy for the smoke nuisance in the welding shop.

(Signed) Chas. Haennser.

CLEVELAND SECTION A.W.S. HAS JOINT MEETING WITH INDUSTRIAL ENGINEERS

The second joint meeting which the American Welding Society has held in conjunction with the Society of Industrial Engineers this winter proved to be a great success.

The evening's entertainment consisted of a Liquid Air demonstration given by Mr. G. E. Harcke of the Air Reduction Sales Co. Mr. Harcke injected a spirit of playfulness in conjunction with the demonstration which did much to make all present feel at home. Following this demonstration Mr. Harcke presented the four reel film entitled "Oxygen, The Wonder Worker." This was accompanied by a most interesting lecture.

The idea of joint meetings again proved to the Cleveland section the great opportunity to obtain fair-sized attendance, as about one hundred persens were present to enjoy the evening.

NEW GOODMAN STOCK LIST

The Goodman Electric Machinery Co., Newark, N. J., is sending out a March stock list of Electric Arc Welders, Spot Welders and Butt Welders, Electric Hoists, Lifting Magnets and Motors. Over forty arc welders are included in the current list. Used equipment is rented as well as sold.

News of the Welding Trade

In the northern states the winter has been severe and unpleasant enough to tempt many of our friends to vacation trips under sunnier skies. E. D. Findlay, president of the Acme Oxygen Company, Chicago, travelled westward to Honolulu, accompanied by Mrs. Findlay.

Elmer Smith, of Smith's Inventions, Inc., Minneapolis, was recently reported on a visit in South America with his wife and his eldest daughter.

A. F. Jenkins, president of The Alexander Milburn Company, Baltimore, is in Florida with Mrs. Jenkins, who is recovering from a recent severe illness.

H. B. Pearson, of the Burdett Mfg. Co., Chicago, spent the holiday season with his family in California.

J. B. Green, president of Chicago Steel & Wire Company, Chicago, accompanied by Mrs. Green, spent the first two months of the year in Florida and the West Indies.

J. B. Burdett, Burdett Oxygen Co., Chicago, was visiting in Florida at just the right time to miss some of Chicago's stormiest winter days.

Another Florida visitor was J. G. Norris of the welding wire department of the Central Steel & Wire Company, Chicago.

A. G. Bissel, arc welding specialist of the Westinghouse Company, made an extended business trip to California, and his observations indicate that welding in the structural steel industry will develop rapidly out there.

The American Oxygen Service Company, New York City, announce the appointment of Mr. Henry F. Pratt as Sales Manager, headquarters at New York. Mr. Pratt has been Eastern Manager for the Purox Company for several years.

Announcement has been received that the Portsmouth Oxygen Corporation have doubled the capacity of their electrolidic hydrogen and oxygen plant. Fifty-two 1200 ampier cells, one additional motor generator set and two 4-stage compressors have been installed.

The Kansas City stock of Weldite Rods, made by the Chicago Steel and Wire Company, Chicago, will be carried by the Western Welding Equipment Company, 308 East 17th St., Kansas City, Missouri.

The Orange County Welding Works, Los Angeles, Calif., have purchased ground for a new one-story brick structure at Santa Ana. The building is expected to cover ten thousand square feet of floor space.

The oxygen business of the Standard Gas Products Co., Atlanta, Ga., was recently purchased by the Burdett Oxygen Co.

The Fall meeting of the American Welding Society will be held at Buffalo, New York, and in connection there will be an exposition of welding and cutting equipment, in the Broadway Auditorium.

Mr. A. V. B. Cutler, with headquarters at 817 West Washington Boulevard, Chicago, Illinois, has been appointed to act as representative for the Acme Electric Welder Company of Philadelphia, in the middle west.

J. J. Gaffney, who for several years has represented The Steel Sales Corporation of Chicago as welding engineer, recently resigned to accept a position with the Una Welding and Bonding Company, of Cleveland, in their New York office.

Mr. John D. Swain, formerly Chicago manager of the Union Carbide Sales Company, has been transferred to the New York office of the company as General Manager, and Mr. Wm. C. Harrison has been appointed Western Manager, with headquarters in Chicago. Mr. E. B. Suydam has been appointed Eastern Manager, with headquarters in the New York office.

Current Welding Literature

AUTOMATIC WELDING OF LEAD CANS.—An automatic oxy-acetylene welding machine produces one-piece cans in continuous operation, from flat steel sheets. Welding is done without any filler material.—Acetylene Journal, March.

THE PART PLAYED BY ACETYLENE IN WARSHIP SCRAPPING, by H. E. Roselle.—Many experiments were tried before acetylene was adopted as the fuel gas for cutting up ships in the Philadelphia Navy Yard. The use of pipe lines results in economy of cutting time and open control of pressures. Money is saved by employing skilled operators. A careful check on equipment is necessary on large projects of this nature.—Acetylene Journal, March.

BRONZE WELDING OF CAST IRON PIPE.—The ideal cast iron pipe line is probably one in which short lengths of pipe are welded together into long sections and the long sections joined by flexible couplings. Bronze welds on cast iron can be made stronger than the pipe itself. The straight butt type of joint is the recommended design.—Acetylene Journal, March.

WELDING ALUMINUM ALLOY CASTINGS, by A. Eyles.—Success in welding aluminum depends, to a large extent, upon the operator's skill in breaking down the oxide film which forms when the metal is melted by the flame. Parts must be prepared for welding by thorough cleaning, and if they are oily by washing in a hot caustic soda bath. Strong welds can be made by using the puddle system. Fluxes also serve the purpose of removing the oxide and prevent the fused metal from getting in contact with the air. It is poor economy to make fluxes in the shop. Pure aluminum is recommended as filler material. Reheating and slow cooling is recommended after welding.—Machinery, March.

BROADENING FIELD OF ARC WELDING, by A. G. Bissell.—The applications of arc welding in the railway field, ship construction, street railway shops, steel mills, oil refineries, airplane factories, steel tank works, structural steel building and mining.—Machinery, March, 1926.

AUTOGENOUS WELDING OF ALUMINUM AND ITS ALLOYS, by A. Eyles.—Welding aluminum alloy castings. Preheating not always necessary. Factors governing torch selection. Regulation of the flame. Rapid manipulation prevents burning. After treatment of welded joints.—American Machinist, March 4th.

GAS WELDED BONDS ON THE ERIE, by C. A. Nichols.—In four years the track mileage on the Erie has grown from ten miles to one hundred thirty-nine miles without a signal failure chargeable to bonding. Records have shown an annual saving of nearly $45.00 per track mile in battery renewals. Nearly fifty-five miles of track were bonded on one division, in 1925. A detailed account of the cost of installing gas welded bonds shows an average cost of forty-three cents each for putting the bonds in place, including the cost of materials and labor. There is no record of bonds failing in service.—Railway Signaling, March.

AUTOMIC HYDROGEN ARC WELDING, by R. A. Weinman and Irving Langmuir.—Description of the apparatus used in the research laboratory of the General Electric Company at Schenectady, for producing arc welds in an atmosphere of hydrogen gas. The character of the arc and the description of some of the welds made in the course of these experiments, together with test data.—General Electric Review, March.

ARC WELDING IN HYDROGEN AND OTHER GASES, by P. Alexander.—A description of the experimental work done in the Thomson research laboratory of the General Electric Company, at Lynn, Massachusetts. Types of special welding handles which enable the operator to use the metallic arc process in connection with a semi-automatic welding head and a task of hydrogen or other gas, so as to perform the welding operation in an atmosphere of hydrogen. The advantages noted by the author on increased heat, which makes beveling unnecessary up to one-half inch thickness and increases speed, and the fact that the hydrogen bath serves to increase the ductility of the weld metal.—General Electric Review, March.

REGO CATALOG NUMBER 40.—64 page catalog published by the Bastian-Blessing Company, Chicago, Illinois, describing and illustrating a complete line of oxy-acetylene welding and cutting apparatus. This includes not only torches and regulators for all oxy-acetylene work, but also generators, trucks, valves, connections, manifolds and fittings. Several complete assemblies of welding outfits are featured. There is also included information on the selection of tips and pressure, the laying out of work shops and a number of tables of useful information for welders.

A. E. F. WELDING.—Illustrated monthly bulletin of the American Electric Fusion Corporation, Chicago, Illinois. The February issue of the bulletin discusses the principles of the auto-coil type of regulation for resistance welders and points out the advantage of this type of regulation, particularly as a safety feature. Another article in the same issue compares the cost of riveting in sheet metal fabricating plants with the cost of spot welding.

REGULATIONS OF THE N. B. F. U.—Recommendations of the N. F. P. A. for provisions of the regulations applying to the installation and operation of gas systems for welding and cutting. The rules now deal with all combustible gases and do not prescribe for acetylene only. Copies of these rules can be secured by applying to Mr. H. E. Newell, National Board of Fire Underwriters, 76 Williams Street, New York City, New York.

PROVING WELDS BETTER THAN RIVETS, by C. Bradshaw.—The results of tests constituting the basis for compiling data on the strength of welded joints. The data published gives the result of experiments made in a period of three years at the Engineering School of Melbourne University, Melbourne, Australia. In the tests made, the object was not to break the specimens in the body of the metals, but to break the welds in order to obtain reliable data on their strength.—Canadian Machinery, March 4th.

REVEALING STRENGTH OF WELDS IN SHEAR, by C. R. Young.—A discussion of the tests made by the University of Melbourne for the Metropolitan Gas Company, pointing out that shear is the prevailing type of stress to be provided against, and until the behavior of welds under this kind of stress is thoroughly established by test, structural engineers will go slowly in adopting them in preference to riveting.—Canadian Machinery, March 4th.

STELLITING OF METAL PARTS.—Booklet published by the Haynes Stelliting Company, Kokomo, Indiana. The first part of this booklet is a description of stellite, which is an alloy of croneum, cobalt and tungsten. The important characteristics of this alloy are its hardness at high temperatures and its great resistance to abrasion. These properties are responsible for the use of stellite for the servicing of heavy machinery parts and for its application where a combination of high mechanical strength and great resistance to heat, abrasion and corrosion are necessary. The booklet, therefore, gives a complete procedure control for applying stellite to various grades of steel, by means of the oxy-acetylene flame.

SMITH-O-GRAMS.—Monthly booklet of Smith's Inventions, Incorporated, Minneapolis. In the February issue is an article describing three types of signs which can be built with oxy-acetylene equipment, some uses for oxy-acetylene equipment in the power plant and the use of carbide to thaw frozen fire hydrants.

WELDING PRACTICES ON THE SANTA FE.—Methods followed in making repairs by electric or gas welding, details of procedure followed in preparing boiler sheets for welding and welding locomotive frames. Safety suggestions for welders employed on the Railroad.—Railway Review, March 27th.

BRITISH BOILER SHOP PRACTICE, by T. J. Drover.—A discussion of the welding methods and of the various types of boiler furnaces in general use in England.—Boiler Maker, February.

TRUCK BODIES BUILT BY WELDING, by R. E. Kinkead.—Experiments conducted over several years, by builders of heavy bodies, show that welded construction gives one-fourth greater strength, with one-third less cost.—Automotive Manufacturer, January.

PROCEDURE CONTROL FOR OXY-ACETYLENE WELDING CAST IRON HEATER SECTIONS, by A. W. Heygwood.—The welder should be experienced in repairing thin cast iron sections. Locate the crack accurately and preheat with charcoal, beveling and reinforcement are not necessary on thin castings. Have the casting well supported and clean it thoroughly in the neighborhood of the crack. Keep it covered as much as possible during the welding. Build up carefully and avoid large puddles. Reheating after welding, allowing twenty-four hours for cooling. Test at sixty pounds pressure.—Journal of the A. W. S., February.

WELDING AS THE MEANS OF FABRICATING TANKS, VESSELS AND PIPES, by W. Schenstrom.—Welded construction eliminates tremendous losses through leaks, seepage and evaporation, which occur in riveted tanks. New methods of welded construction promise additional advantages for welding. This type of construction is being applied to tanks of all sizes, including vacuum tanks. Large diameter pipes are being made by welding.—Journal of the A. W. S., February.

GOLD IN THE WELDING PROCESSES, by R. E. Kinkead.—There are big opportunities for those who are thoroughly familiar with the possibilities of welding and observing enough to detect opportunities, for putting them to work. It is not so much a question of long training as of common sense in applying well known principles.—Journal of the A. W. S., February.

FUSION WELDED PRESSURE VESSELS, by S. W. Miller.—A discussion of the present code regulating the use of fusion welding in various types of construction, particularly unfired pressure vessels. The present code practically condemns fusion welding as a process, and needs revision in several of its parts. A new code for fusion welded pressure vessels is suggested and accompanied by designs for welded joints. Attention is called to several unnecessary restrictions in the present code.—Journal of the A. W. S., February.

OXY-ACETYLENE TIPS.—Monthly publication of the Linde Air Products Company, New York. One article in the March issue features the importance of oxy-acetylene welding and cutting in ship repairing and in equipment fabrication, both in shipyards and at sea. Another describes the use of the welding torch in production work, giving a particular instance where it permitted the elimination of difficult machining operations and reduced the cost. A spectacular performance was recorded in the story of how a forty-three feet long cutting torch was made especially to allow removing a cast iron pump which had fallen into a well casing and threatened a city water supply. A description of custom built pipe fittings is a useful suggestion for job welding shops. An article on repairing cans, barrels or tanks gives the welder some important safety precautions. Illustrations of good and bad welding material show to test the weldability of steel sheets. An article for those who weld on cast iron discusses the principle of expansion and contraction.

STUDY OF THE MEANS OF INTRODUCING OXY-ACETYLENE WELDING.—A discussion of the various methods which may be followed to secure more adequate instruction in the technique of oxy-acetylene welding in technical and professional schools in France.—Revue de la Soudure Autogene, January.

SUPERVISING WELDERS AND TESTING WELDS, by A. Des Granges.—Some of the methods which are followed in industrial plants for examining welders as to their ability and testing finished welds for quality. Illustrations are shown of a number of different types of test pieces and the methods of making tests.—Revue de la Soudure Autogene, January.

WHAT OCCURS DURING OXY-ACETYLENE CUTTING OF STEEL, by S. W. Miller.—A detailed description of the oxy-acetylene process, showing just how the cut is made and illustrating by means of micro-photographs the effect of the temperature of the operation on the metal in the neighborhood of the cut.—Industrial Gases, London, December.

PRESSURE OF ACETYLENE APPLIED TO OXY-ACETYLENE BLOW PIPES, by Arthur Stephenson.—Criticism of a recently published article on the subject of what pressure of acetylene brings the best results in the oxy-acetylene process.—Industrial Gases, London, December.

CAST IRON CUTTING.—Abstracts of recent articles on the subject of cast iron cutting, one dealing with the cutting of the cast iron front of a large office building and the other showing the application of the process to the demolition of heavy machinery.—Industrial Gases, London, December.

WELDING WITH TOBIN BRONZE.—A series of articles by different authors, describing the application of tobin bronze to the repair of cast iron parts. Among the examples given are a smokestack, an air compressor, a steam cylinder and a cast iron pulley.—Railway Mechanical Engineer, March.

CUTTING CAST IRON WITH THE BLOW PIPE.—Description of a new type of cast iron cutting torch, in which a special preheating flame is used to raise the temperature of the cutting jet of oxygen, with diagrams of some operations already successful reported by manufacturers of this torch.—The Welding Journal, London, February.

Classified Ads

Help Wanted—75c per line, minimum 4 lines.
Jobs Wanted—4 lines free.
Other Ads—$1.00 per line, minimum 4 lines.
Counted 8 words to line. Add 6 words for keyed address.

Wanted—The name and address of every gas and electric welder in America. Knight Bros., 113 S. Oakley Blvd., Chicago, Ill.

For Sale—We still have available the service rights on a few W. K. and W. C. Prest-O-Lite Cylinders. Address Remington Arms Company, Inc., Bridgeport, Conn.

Position Wanted—By acetylene welder with three years' experience in all lines. Desires a permanent position. Address 86, care The Welding Engineer.

For Sale—At a bargain, strictly new 100-lb. Acetylene Generator, in the original factory crate. Price, $225.00, F. O. B., Butler, Pa. Address Keystone Pipe & Supply Co., Butler Pa.

For Sale—One 600 ampere 3 to 4 operators contact potential C. & C. Welder with direct current 220 volt circuit connected drive. Can be seen in operation at The Vilter Mfg. Co., 935 117 Clinton St., Milwaukee, Wis.

THE ALEXANDER MILBURN COMPANY
1416-1428 W. Baltimore St.,
Baltimore, Md.
Has several excellent openings for thoroughly qualified salesmen in different portions of the United States. Excellent opportunities for men with established connections in the welding and cutting industry. Send full particulars.

Position Wanted—Salesman with eight years' experience in the oxy-acetylene field selling both direct and establishing distributors is open for an immediate connection. Thoroughly understands the equipment and supply business and can prove his statements by an excellent sales record. Will welcome replies from Electric Welding field. Address 85, care of The Welding Engineer.

Position Wanted—Acetylene welder of eleven years' experience desires permanent position. Capable of directing work. Would consider partnership in growing shop. Address A. W. Young, 1113 21st Street, Des Moines, Iowa.

Position Wanted—Capable electric arc welder with eleven years' diversified experience wishes new connection. Can take complete charge of welding shop. Will go anywhere. Can also sell and demonstrate welding equipment. Address 87, care The Welding Engineer.

For Sale—Used Fordson Tractor Lincoln welder. Self contained portable electric welding outfit with place for oxy-acetylene outfit and tools. Send for particulars to Flowers Welding & Cutting Co., Canton, Ohio.

Wanted—Blacksmith, experienced in electric or gas welding, electric preferred. Must understand auto spring work and tool tempering in job shops. Permanent position. Address Norwich Welding Co., Norwich, Conn.

For Sale—Service Rights on a number of W. C. Prest-O-Lite cylinders. Also two good second-hand torches. Address Gits and Gits, Marshall, Minn.

Kerr's Training Course

in Practical Welding

A Standard to go by—

An Instruction Course for ***completely training*** or ***improving*** the man who uses the torch, and for the Company that wants better welding from its welders.

There is a separate lesson for each type of job in Welding, Cutting, and Brazing, with full Explanation, Illustration, and Instruction in exactly what to do—Why it is done—How to do it—and what each job should look and be like. All metals covered.

If you do welding this Course is a Standard by which to judge your ability, your welds, cuts, and brazes. If you employ welders, it is a standard by which to judge the ability of the men you hire.

Master Welder's Diploma
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Graduation requirements: Examination average 80% or better; and test welds which we send you.

Satisfaction Guaranteed
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For particulars and a free sample lesson write at once giving name, address, and place of employment. State your welding experience, and if you have the use of a welding outfit. (No obligation involved.)

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Make One Motor Do the Work of Two

If yours is a general repair shop, you have to do both drilling and grinding, but you don't need to buy two separate tools. The WODACK Combination Portable Electric Drill and Grinder will handle both jobs, and save money for you. It's a tool you need.
"Electric Tool Facts" tells all about it. Send for your copy.

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Patented Nov. 1, 1921

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takes the "guess" out of welding

Welders who work with Page-Armco and Steel "Processed" Welding Wire and Electrodes do so with full confidence that the job they are doing will turn out right.

They know from experience that the exclusive Page method of "Processing" all wire and electrodes to meet the exact requirements of every class of work assures satisfactory results,—and takes the guess out of welding.

As a result, users who specify Page "Processed" Wire or Electrodes, save their welders' time, eliminate spoiled work and find their costs considerably lessened.

Page Mild Steel Gas Welding Wire and Electrodes, Page-Armco Wire and Electrodes and Page High Carbon Wire and Electrodes are rapidly being specified as standard. We invite you to test them under the most exacting conditions of your shop and judge for yourself. Write today for interesting literature and samples. No obligation.

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You'll find SWEDOX products free from impurities, uniform in analysis and therefore economical because their use reduces the cost of application and of machining.

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They make the strongest, soundest, toughest welds with the least trouble in welding.

Conform to American Welding Society specifications.

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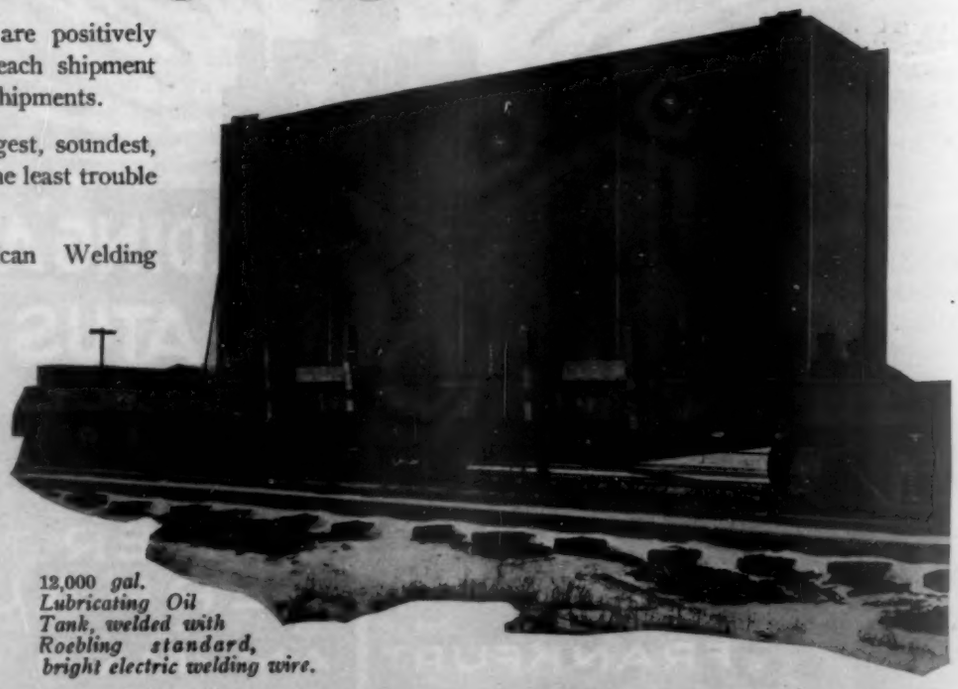

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All "Raco" Welding Wires are guaranteed to meet the American Welding Society specifications in every particular, and in addition are subject to rejection from any cause whatsoever.
The well established policy of THE REID-AVERY CO. to specialize in welding wire only insures absolute satisfaction to our customers. Lowest prices consistent with unvarying quality, prompt attention to orders, unlimited guarantee.

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Has your experience in Manganese Welding been of the hit and miss variety? After hours of painstaking work with sputtering arc have your raised your hood with a sigh and said "well done?" Or have you guessed that the job was "well done" when you knew that the big possibility was there that you may have been merely burning up high priced steel? Would relief from this guess-work be worth investigating?

There IS something new under the sun—"WELDMACO"—and it makes a deposit of 12% to 13% Manganese, free of Blow-Holes, Craters and Cracks. It flows as easily as a low carbon rod and gives deep penetration without damage to the steel structure of the work-piece.

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Before buying acetylene cylinders for their plant, the Engineering Department of this large company made a thorough investigation of the subject. When they placed their order, it was for SEAMLESS, *MONOLITHIC FILLED ACETYLENE CYLINDERS.*

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Any acetylene user can be shown why he should insist upon gas being delivered in truly seamless, monolithic filled cylinders. Specify them.

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Much loss of time and money for both the dealer and the welder results from failure to give sufficiently complete information when ordering welding rods.

Tell your dealer the nature of your job and describe the material upon which you are working. Specify Wickwire Spencer Wissco Welding Wire and he will send the grade best adapted to your needs.

Because of its freedom from oxides and other impurities, Wickwire Spencer Wissco Welding Wire will save your time and will insure jobs that will give satisfaction.

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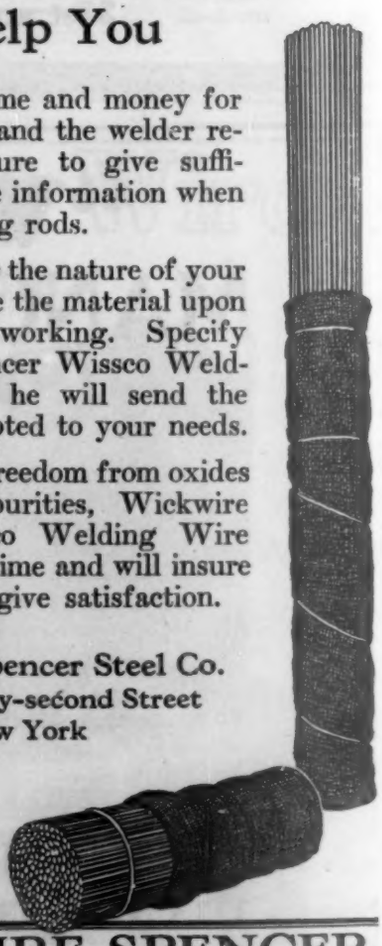

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Made in all diameters, lengths and sizes.

Small diameter rods are sold in 4, 6 and 8 inch lengths, the shorter the rod the less breakage in shipping.

Also Dixon's Graphite Welding Putty. In 5 and 10 lb. cans.

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In the Electric Railway Industry the UNA Process of Welding is widely used to weld the **low-carbon** fish-plate to the **high carbon** steel rail.

The weld metal must be strong, tough and ductile to stand up under the constant wear and tear of the car wheels passing over the welded joint.

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For maximum working speed and GOOD work without greatly increased cost, get acquainted with the Koro corrugated rod.

Koro in the hands of a capable operator is the fastest welding rod on the market except paper coated rods, which cost much more.

The crystallized resistance centers in Koro rods induced by the system of corrugations make a lag in the current that gives regular flow of molten pellets and quiet arc that does not splatter.

Rods of all standard sizes and for all standard classes of work carried in stock for immediate delivery. WE'LL FILL ONE TRIAL ORDER (50 LBS. ANY SIZE) FROM ANY NEW CUSTOMER, AT QUANTITY PRICES. WRITE US!

Improved Hand Welder

Here's a new kind of holder, light, well balanced, insulated against heat and current, no springs or pivots to heat up and stick—yet—it grips the electrode firmly, insuring contact and no short arc. You can drop out the hot stub with ONE HAND—a slight push a certain way and it's gone.
Price but $6.00. Get one and give it a trial. Money back if not satisfied.

KORO

ELECTRIC CORPORATION
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OXECO
ACETYLENE CYLINDERS

ONE of the largest manufacturing concerns in the United States, with a world-wide engineering reputation, operates an acetylene compressing plant that supplies cylinders of acetylene for use in one of its large factories.

Before buying acetylene cylinders for their plant, the Engineering Department of this large company made a thorough investigation of the subject. When they placed their order, it was for SEAMLESS, *MONOLITHIC FILLED ACETYLENE CYLINDERS.*

When a company not primarily in the gas industry and with a world-wide engineering reputation, pays a premium for truly seamless, monolithic filled cylinders, it is a definite indication of the superiority of this type of container. They were looking for the best cylinders from an investment standpoint. They also wanted the best and safest cylinders from a user's standpoint. They drew their specifications accordingly.

Any acetylene user can be shown why he should insist upon gas being delivered in truly seamless, monolithic filled cylinders. Specify them.

KEITH DUNHAM COMPANY

110 South Dearborn Street
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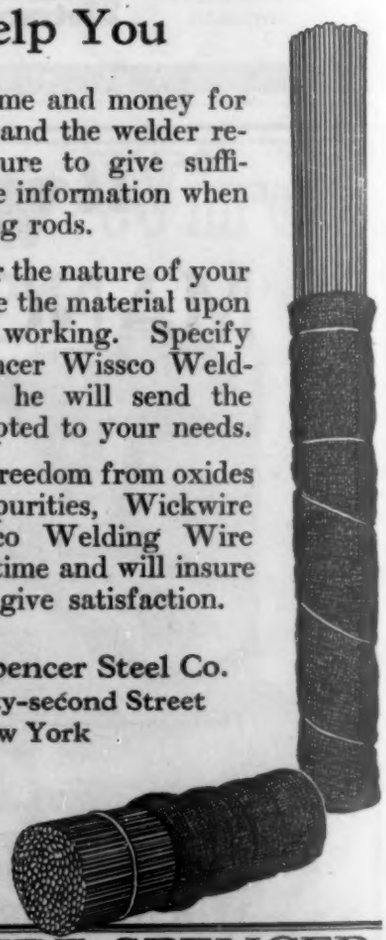
Help Your Dealer To Help You

Much loss of time and money for both the dealer and the welder results from failure to give sufficiently complete information when ordering welding rods.

Tell your dealer the nature of your job and describe the material upon which you are working. Specify Wickwire Spencer Wissco Welding Wire and he will send the grade best adapted to your needs.

Because of its freedom from oxides and other impurities, Wickwire Spencer Wissco Welding Wire will save your time and will insure jobs that will give satisfaction.

Wickwire Spencer Steel Co.
41 East Forty-second Street
New York



WICKWIRE SPENCER *PRODUCTS*

Dixon's Graphite Rods and Plates for Welding

Made in all diameters, lengths and sizes.

Small diameter rods are sold in 4, 6 and 8 inch lengths, the shorter the rod the less breakage in shipping.

Also Dixon's Graphite Welding Putty. In 5 and 10 lb. cans.

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JERSEY CITY, N. J.
Established 1827

STRONG, TOUGH AND DUCTILE WELD METAL

In the Electric Railway Industry the UNA Process of Welding is widely used to weld the **low-carbon** fish-plate to the **high carbon** steel rail.

The weld metal must be strong, tough and ductile to stand up under the constant wear and tear of the car wheels passing over the welded joint.

This rapid and economical welding process can be applied to your own welding problem in order to obtain the necessary strength, toughness and ductility so essential in a good weld.

Your inquiries solicited.

THE UNA WELDING & BONDING CO., Cleveland, Ohio

Welding Processes
Welding Rods

UNA PRODUCTS

A.C.—D.C. Welders
Welding Supplies

USE KORO ELECTRODES

For maximum working speed and GOOD work without greatly increased cost, get acquainted with the Koro corrugated rod.

Koro in the hands of a capable operator is the fastest welding rod on the market except paper coated rods, which cost much more.

The crystallized resistance centers in Koro rods induced by the system of corrugations make a lag in the current that gives regular flow of molten pellets and quiet arc that does not splatter.

Rods of all standard sizes and for all standard classes of work carried in stock for immediate delivery. WE'LL FILL ONE TRIAL ORDER (50 LBS. ANY SIZE) FROM ANY NEW CUSTOMER, AT QUANTITY PRICES. WRITE US!

Improved Hand Welder

Here's a new kind of holder, light, well balanced, insulated against heat and current, no springs or pivots to heat up and stick—yet—it grips the electrode firmly, insuring contact and no short arc. You can drop out the hot stub with ONE HAND—a slight push a certain way and it's gone.
Price but $6.00. Get one and give it a trial. Money back if not satisfied.

KORO

ELECTRIC CORPORATION
229 W. ILLINOIS ST. CHICAGO, ILL.

K-G TORCHES
REGULATORS
COMPLETE UNITS

K-G WELDING AND CUTTING CO., Inc.

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WELDING HELMETS
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ELECTRODE HOLDERS
(Metallic and Carbon)

SINCE 1914

High quality and serviceability have caused Bowers' Helmets and Hand Shields to enjoy largest sales.

The new home of these products is a modern, splendidly, equipped factory with 400% increased capacity.

We offer our unexcelled facilities for light manufacturing to those having suitable specialties.

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TRADE MARK
Welding Rods

A Uniform dependable quality, you keep on using.

A grade for every purpose.

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"It isn't only the analysis that counts!"

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Modern Goggles for Welding and Cutting

Also modern welding helmets and handshields; and respirators for dusty work and spraying.

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Manufacturers af goggles, respirators and welding helmets
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Seneca Brand

Gas Weld and Electro Weld Rods

For Various Requirements

GRADE NO. 1. For Electric Welding, a low carbon soft wire with a smooth soft action in the arc.

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GRADE NO. 3. Acetylene Welding—a low carbon smooth rod suitable for all general repair shop use.

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All Grades supplied in accordance with customer's requirements.

Highest quality guaranteed.

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Established 1905

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Winners on their Merits!

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HOLLUP

WIRE AND ELECTRODES

Because They Prove Their Worth

There is a grade of Wanamaker Coated Electrode or Rex Bare Wire for arc or oxy acetylene welding which will uniformly meet your requirements.

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Our No. 11 Shield, especially for welders who wear correction glasses. You will enjoy the comfort and freedom afforded by it.

This shield is fitted with "ESSENTIALITE" Welding Glass—The glass you will like. Price, $4.00 each, f.o.b. Chicago, Ill.

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Ideal Face Shields protect the head, chest and neck against direct and reflected rays. Easily adjusted and removed. Constructed of vulcanized fibre and aluminum, assuring durability and lightness. Hinged door allows quick inspection of work or interchange of glasses.

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The Ideal Glove for Electric and Acetylene Welders is made from Sheep Skin, which has been Subjected to an Asbestos Treatment and which makes it both heat resisting and fireproof.

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The Ideal Apron for Welders is made of leather which has been especially treated to stand the heat, and at the same time be very flexible and durable.

THE IDEAL FACE SHIELD CO.

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HOXITE

THE FLUX FOR ALL METALS

Aluminum
Cast Iron
Malleable Iron
Brass
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Bronze, Etc.

Makes shape welding easier
Makes vertical welding easier

No frothing,
No blow off,
No disagreeable fumes.

PRICE $1.00 PER POUND

THE HOXITE COMPANY

62 SUMMER ST., STAMFORD, CONN.

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You Can Do It Better With **TORCHWELD**

WE GAVE YOUR NEEDS FIRST CONSIDERATION

and so we build Cutting Torches of either one piece or two piece tip construction so as to meet every operating requirement with Cutting Torches of Demonstrated Dependability.

Model 15MC or 25MC Torchweld Non-Flash Cutting Torch, furnished regularly with 85° or 70° Head, or with special angle heads on order.

Send for Catalog 23E

TORCHWELD EQUIPMENT COMPANY

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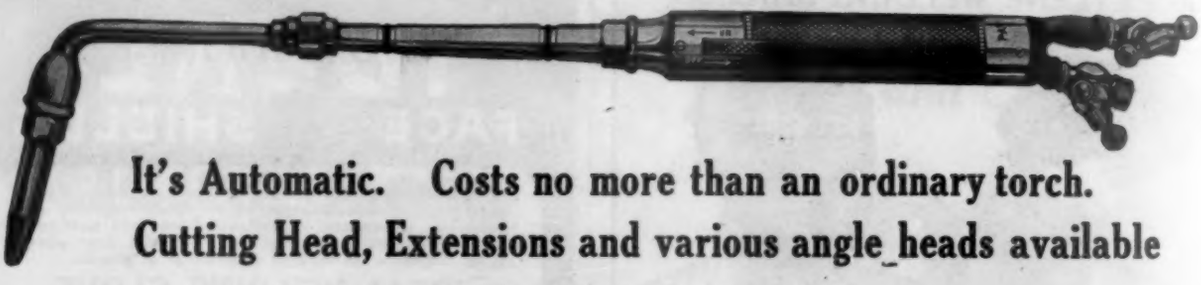
THE
ALMANC
METALLIC
ELECTRODE HOLDER

Most Simple—Most Efficient—Metallic Electrode Holder Yet Developed.

There are no springs to lose tension for the grip is positive through both jaws. Careful construction has reduced heating to a minimum, while the operator is at the same time fully protected from shocks. It is simple to quickly insert and release the electrodes, which can be used with very small amount of waste. Its construction permits the removal or replacement of the holder cable with only the aid of a screw driver—it is not necessary to use soldering. All of these exclusive features make the Almanc Metallic Electrode Holder a wise buy.

Distributors Wanted

ALLAN MANUFACTURING AND WELDING CO.
726 Washington St., Buffalo, N. Y.
Welding Equipment Welding Accessories



It's Automatic. Costs no more than an ordinary torch.
Cutting Head, Extensions and various angle heads available

Manufactured and Patented by

UNITED STATES WELDING CO., Inc., Minneapolis, Minn., U. S. A.

MAKERS OF FAMOUS "U. S." WELDING AND CUTTING APPARATUS

DEPENDABLE APPARATUS FOR ALL CASES
DEALERS
OUR PRICE WILL INTEREST YOU

SUPERFLUX
FOR ALL OXY-ACETYLENE WELDING

Here is the flux you have been waiting for. It keeps the metal surface clean, does not swell, and permits welding without hardening the parts welded.

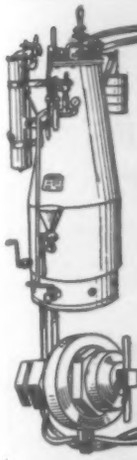
IT IS THE SUPERFLUX FOR WELDING

PRICE $2.00 [CAST IRON—CAST STEEL—COPPER MILD STEEL — BRASS — BRONZE] PER POUND

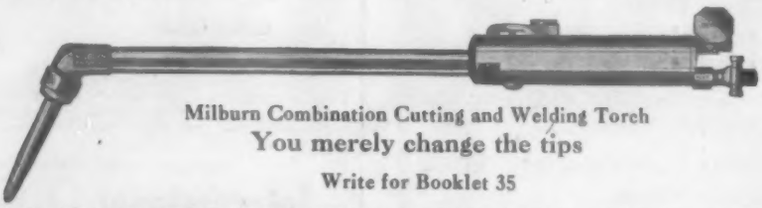
Made by the makers of the Famous Laffitte Welding Plates and Tempering Powder.

A full line of Welding Rods in stock at all times

THE PHILLIPS-LAFFITTE COMPANY
INCORPORATED 1909
1005 PENNSYLVANIA BLDG. PHILADELPHIA, PA.

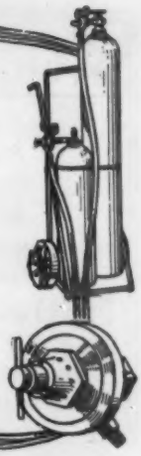


WELDING AND CUTTING TORCHES,
REGULATORS, GENERATORS and PREHEATERS



Milburn Combination Cutting and Welding Torch
You merely change the tips
Write for Booklet 35

THE ALEXANDER MILBURN COMPANY 1416-28 W. BALTIMORE ST. BALTIMORE, MARYLAND



If you dig into facts you will find

lives up to its slogan "More Gas per Pound"—

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SPECIAL PRICES

On Page-Armco dry copper coated acetylene welding rods:

3850 lbs.	3/8 x 36	at $6.00 per 100 lbs.
2950 lbs.	5/16 x 36	
150 lbs.	3/16 x 36	
7300 lbs.	5/32 x 36	

Conform to A. W. S. and U. S. Navy specification, stock delivery (offered subject to prior sale).

Also 1050 lbs. 1/16 x 36 at $10.40 per 100 lbs.

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WELDING SERVICE COMPANY :: 30 Church St., New York

Eye Protection

Goggles
Helmets
Hand Shields
Spectacles

WE MAKE *all* styles to meet *all* requirements of *all* safety codes
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Guaranteed Comfort-Strength-Protection Economy

STRAUSS & BUEGELEISEN
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OXY-ACETYLENE PROCESS

New Mixing Principle

a regulator that accurately controls gases, the greatest working range ever covered by ONE torch—are exclusive IMPERIAL features.

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National Round Welding Carbons
National Welding Carbon Plates
National Welding Carbon Paste
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Our welding carbon products are designed especially for welding operations

National Carbon Company, Inc.
Carbon Sales Division
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INDUSTRIAL GASES

OXYGEN — HYDROGEN
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Quick shipment and low prices. Also cylinders, valves, Eyosee and International welding and cutting torches, regulators, welding wire, cast iron and aluminum rods, fluxes, plain and armored rubber hose, asbestos pads and paper, goggles, etc. All equipment fully guaranteed. Write for catalog and prices.

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Furnished In Any Capacity from 70 Cubic Feet Per Hour Upwards.

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Mild Steel
High Carbon
Manganese
Cast Iron
Gives Machinable Weld

H. E. STEINBOCK
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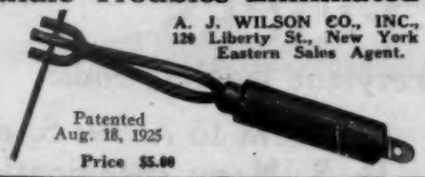
Welding Handle Troubles Eliminated



A. J. WILSON CO., INC.,
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Eastern Sales Agent.

STOODY CO.
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Manufacturer

Patented
Aug. 18, 1925
Price $5.00

REBUILT LINCOLN WELDERS

6-200 amp. motor drive 3 phase 60 cycle on trucks.
2-300 amp. motor drive 3 phase 60 cycle.
3-200 amp. motor drive D. C. 220 volts.
Our stock list shows 40 more arc welders, spot welders and butt welders.

GOODMAN ELECTRIC MACHINERY CO., 126 Green St., Newark, N. J.

Use Collins Rubber Stamps to Identify Cylinder Contents

Made expressly for cylinder stamping, with special waterproof ink in black or colors.

Trademarks reproduced. Send your sketch.

The Collins Stamp Mfg. Co., Inc.
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ARC WELDER DISTRIBUTORS WANTED

We desire distributors to sell and supervise the sale of USL electric arc welding equipment. Unusual money making opportunity for men who are qualified and familiar with arc welding and its applications. A worthwhile connection. Further particulars upon request. Write Department M.

U. S. LIGHT & HEAT CORPORATION
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DRILL—GRIND—POLISH
STRAND
FLEXIBLE SHAFT EQUIPMENTS

Several Sizes

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Prest-O-Lite

SERVICE RIGHTS
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Prest-O-Lite Welding Cylinders
BOUGHT AND SOLD

ALFRED E. CORP
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For the Oxy Acetylene Welder.
Price $1.00

ALL STEEL WIRE BRUSHES
45c Each, 3 for $1.00

Write for Dealers' Prices

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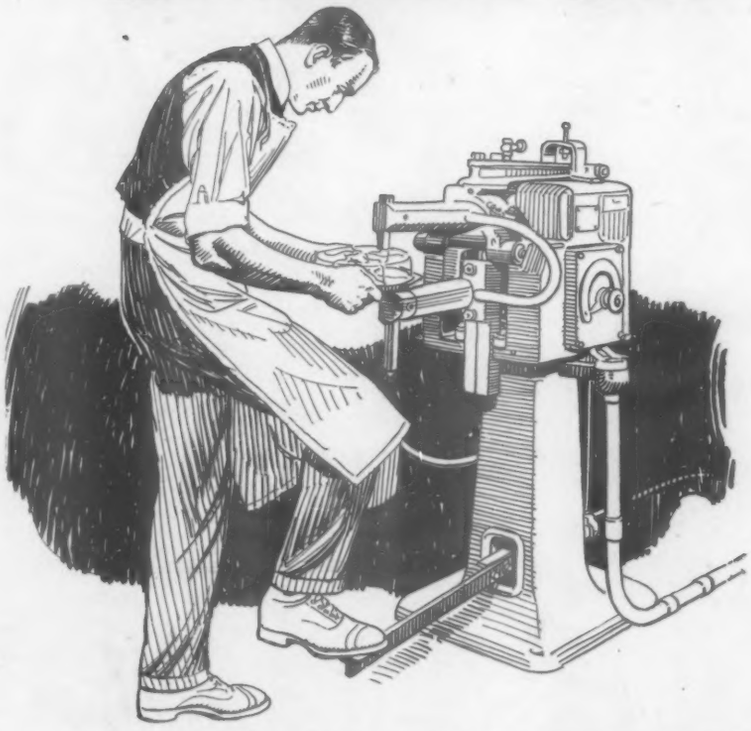
Westinghouse

WESTINGHOUSE ELECTRIC

manufactures complete arc welding equipment for all welding and cutting purposes. Write for Leaflet 1719 which describes this equipment in detail.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

ELKONITE



The KNAPP ELECTRIC CORPORATION Port Chester, N.Y., solved difficult manufacturing problems in spot and lap welding by using Elkonite Welding Alloys where hard-drawn copper failed.

WHERE HARD-DRAWN COPPER FAILS

You can rely upon

ELKONITE WELDING ALLOYS

ELKONITE—a series of copper tungsten alloys based upon original General Electric Co. patents—has been developed by Elkon engineers to a point of perfection which makes it supreme for resistance pressure welding where hard-drawn copper fails. Elkonite Welding alloys vary in composition from No. W, which is easily machinable, to No. W. 25, which can be formed only by grinding. Brinnell Hardness about 225 under *all* conditions (hard-drawn copper 90, dropping to 40 in service). Each Elkonite Welding alloy is adapted to special requirements.

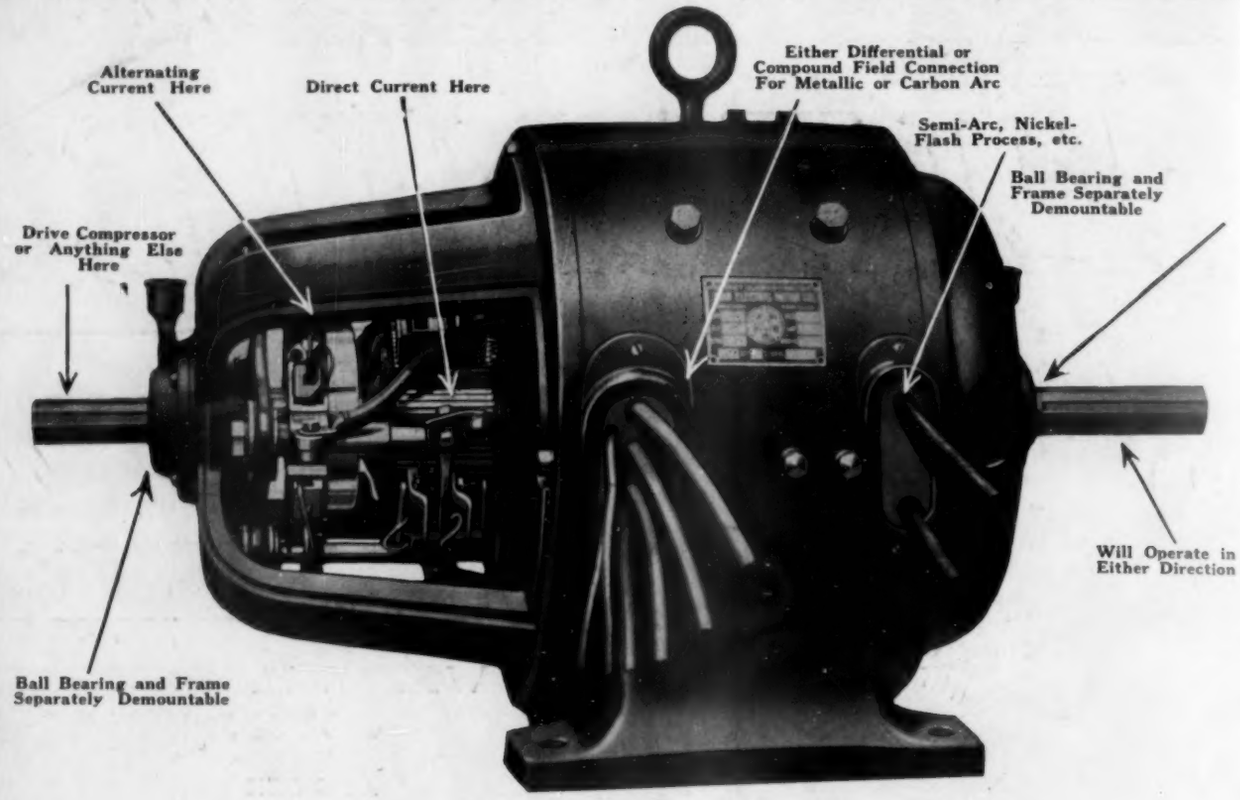
Some of the marvelous achievements of Elkonite, among which is that of making the spot welding of brass commercially practicable and which will be described in later advertisements of this series, could hardly be believed without the evidence of the user.

If you have a special problem in resistance pressure welding (spot, line, butt, lap, ridge, or projection)... let the Elkon engineering staff have the opportunity to prove to you the many economies and advantages of the proper Elkon Welding alloy.

ELKON WORKS Inc.
Subsidiary of P. R. Mallory & Co. Inc.
Weehawken, N. J.

Also manufacturers of ELKON CONTACT POINTS of Tungsten, Silver, Platinum, Special Alloys
ELKON TRICKLE CHARGER. Molybdenum Sheet Metal Product

SPECIALISTS IN RARE ELEMENT METALLURGY


Alternating Current Here
Direct Current Here
Either Differential or Compound Field Connection For Metallic or Carbon Arc
Semi-Arc, Nickel-Flash Process, etc.
Ball Bearing and Frame Separately Demountable
Drive Compressor or Anything Else Here
Will Operate in Either Direction
Ball Bearing and Frame Separately Demountable

Inside Facts Concerning the—

DUALARC WELDING GENERATOR

This picture shows a method of generator construction which embodies the highest degree of flexibility. It not only delivers both alternating current and direct current for welding, but by connecting the A. C. leads with a small transformer it furnishes 110 volts for the operation of electric grinders, drills, small motors and electric lights.

Some welders prefer direct current for certain types of work. The Dualarc generator will deliver that current. For other types of work many operators have a distinct preference for the alternating current. You can get this current from this same generator. In addition to this, provision for both the metallic and carbon arc is provided by means of the series field being reversible; differential for the 20 volt metallic arc and compound for the 40 volt carbon arc.

Where there is a great variety of work to be done this welder is truly unsurpassed. It furnishes two machines for the price of one and gives the user a chance to take advantage of the developments which are made in both alternating current and direct current arc welding.

An Outfit for Every Requirement

For shop use the Dualarc can be operated as a motor generator set.

Portability is obtained by mounting the Dualarc as a gas engine driven set in portable frame which can be used in the shop or loaded on a truck.

For complete portability the outfit is furnished equipped as a gas engine driven generator and mounted on either a semi-trailer or full trailer.

We also sell the generator separate fully equipped for direct gas engine or motor drive or for belt, chain friction or gear drive and we sell our gas engine sets knockdown for customers assembly and can furnish choice of our engine guaranteed or Buda, Leo Roi, Continental with their guarantee.

ELECTRIC ARC CUTTING & WELDING CO.
152-158 JELLIFF AVE.. NEWARK. N. J.. U. S. A.